PRICE RISK MANAGEMENT STRATEGIES IN A NATURAL RUBBER INDUSTRY: A CASE STUDY OF RUBBER BUSINESS INTERMEDIARIES IN THAILAND

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Abstract

Commodity prices have been more volatile in recent years. The volatility of prices widely impacts throughout the majority of stakeholder in commodity supply chains. Natural Rubber (NR) is one of the main exporting commodities in Thailand where millions of small farmers rely mainly on the NR producing to generate income for their living and children's education. The existing literature relevant to commodity Price Risk Management (PRM) is dominated by developed countries in which markets have well-developed infrastructures. Although some research has been conducted in developing countries, most of it focuses on farmers or exporters whilst intermediaries who play a vital role as a middle tier in the supply chain are absent. In NR supply chains, the intermediaries are likely to be the ones who are exposed to the highest risk from price volatility. Their profit margins have diminished due to increasing market power of farmers and their greater accessibility to price information via the internet and mobile phone. Therefore, when NR prices become more fluctuated, the impact on Rubber Business Intermediary (RBI) businesses is even higher than beforehand.

This research aims to explore the PRM strategies adopted, and to understand the PRM practiced by RBIs when it comes to managing their business in the south of Thailand. A qualitative method is used as a research approach in this study. 24 RBIs in seven provinces, including the three biggest NR producing provinces in Thailand, were targetted using semi-structured interview and pre-interview questionnaire methods. The interview data was analysed using the template analysis method and NVivo computer software.

The findings highlight that the PRM strategies involved in the practices of RBIs are fragmented. This is due to the nature of the uncertainty in business circumstance, and the variety of the RBI's personal profiles. The PRM strategies adopted by different types of RBIs are varied, as there are various supply chain structures. Moreover, there are even differences in their use amongst the same type of RBIs. This is mainly caused by the diversity in resources and PRM capability on the part of the RBIs. Furthermore, this research also reveals the lack of the advanced PRM tools in the industry for RBIs. They rely mainly upon informal methods provided by their business partners. It is worth noting that these tools, such as a forward contract, are selectively provided to RBIs depending on their relationships and market powers. The accessibility to available PRM tools has a strong linkage to PRM strategies adopted by RBIs. Eventually, adopted PRM strategies incorporated with decisions in risk taking and market channel selection help to determine their business performance.

The research concludes by proposing a conceptual model of PRM in practice that is considered to be original and contributes to the industries involved with high-volume and low-margin trading. This research also has implications to novice or existing RBIs, other stakeholders in NR supply chains, such as producers or processors, and policymakers who require more understanding in PRM in practice.

Keywords: commodity price risk; price risk management; risk-taking decision; market channel selection; natural rubber market

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the University Ethics Committee.

I declare that the Word Count of this Thesis is 84,680 words.

Name: Nontasak Janchum

Signature:

Date:

Chapter 1 Introduction

1.1 Introduction

This research studies Price Risk Management (PRM) in Natural Rubber (NR) supply chains, focusing on a Rubber Business Intermediary (RBI) context. It involves PRM strategies, decision-making with regard to risk-taking, market channel selection, and the factors influencing them. It also includes the study of a price risk environment in which RBIs operate their business based on seven perspectives: PRM tools, market channels, price information, pricing and price forecasting methods, futures market and technology use.

The outline of this chapter is divided into six sections. Section 1.2 provides a rationale for this study. Then an overview of the study context relating to the NR industry, the role of NR in Thailand, the physical and futures NR markets, market liberalisation and, finally, the key role of NR to the south of Thailand is illustrated in Section 1.3. Section 1.4 clarifies the aims and objectives of this research. The overall structure of this thesis is outlined in Section 1.5. Eventually, Section 1.6 provides a summary of the introduction chapter.

1.2 Rationale

Several factors have led to this research topic: PRM in the Thai NR industry. These factors include the importance of NR crops for Thailand, particularly for the south; the vital role that RBIs play in the Thai NR supply chain; the implications of price volatility in relevant markets on NR supply chain stakeholders; the personal interests of the researcher; and finally, the potential value of the research. Greater details with regard to the identified factors are as follows:

1.2.1 The Importance of Natural Rubber in the South of Thailand

In the south of Thailand, NR is considered to be at the heart of the economy in terms of the agricultural crop. Simien and Penot (2011) pointed out that more and more southerners are beginning to grow NR as a mono crop, and critiqued that they over rely on NR without diversifying into other crops. This problem was also found by Jongrungrot and Thungwa (2014) and Longpichai (2013). As Jongrungrot and Thungwa (2014) convincingly suggested, to make NR farmers more resilient to low incomes during periods of low NR prices, this problem may be resolved by intercropping, such as mixing

timber or fruit trees with NR trees. Longpichai (2013) added that one of the barriers that prevents southern NR farmers from diversifying away from a single NR crop plantation, is the farmers' lack of knowledge and their shortage of skills in growing other crops in which they are inexperienced. It is believed that several millions, out of nine million southerners, are involved in NR industries, especially as NR producers. The southern economy is likely to prosper during periods of high NR prices; however, its economy tends to be quiet during periods of low prices. Recently, due to low NR prices the Thai government has started to encourage NR farmers to grow palm oil as an alternative crop (Nobnorb and Fongsuwan, 2015).

The south of Thailand is well known as the original Thai NR plantation area. In 2015 it was over 116 years, since the first NR trees were planted in Trang province in 1899 (Udomjarumani, 2006). This is because the climate is suitable for growing NR trees that give high yields. It is believed that the best area to grow NR trees is located within the range between ten degrees above and below the equator (Barlow, Jayasuriya and Tan, 1994); the south of Thailand is situated in this area. The weather, in particular high rainfall, produces a high yield of NR trees, and is one of the reasons why the south is the most important area in Thailand. However, Makkaew and Sdoodee (2015) suggested that a changing pattern of rainfall has resulted in low NR productivity and has caused disease in NR trees in part of this area in recent years.

Before NR plantation expanded to the north and northeast of the country, almost all NR trees were grown in the south - only a small fraction of them are grown in the east. The NR production in the south was just over 87 per cent of the total in Thailand in 2004 (Rubber Research Institute of Thailand, 2005). In 2011, NR production in this area reduced to some 76 per cent of overall production. Despite this, the NR plantations account for 64 per cent of the total NR plantation area in Thailand (Office of Agricultural Economics, 2013). This is because most of the new NR plantations are still in their gestation period and there is a higher yield in the south.

In terms of NR plantations in the south, Surat Thani province is the biggest, accounting for 1,921,698 rai (320,283 hectares) or just over 10 per cent of the country. Songkhla and Nakhon Si Thammarat provinces are the second and third largest, accounting for 8.5 and 8 per cent of the country's production, respectively in 2011 (Office of Agricultural Economics, 2013). It is worth noting that the three main central markets are located in these provinces and these markets are one factor in the success of the expansion in the NR growing area. As a consequence, the south of Thailand has become one of the world's main NR producing regions.

1.2.2 The Importance of Rubber Business Intermediaries in Supply Chains

Thailand is one of the biggest NR exporting countries in the world, with approximately one third of world exports (Delarue and Chambon, 2012), accounting for some 11 billion dollars from January to October 2011 (Thai Rubber Association, 2011). Unlike those of Malaysia (Ratnasingam, Ioras and Wenming, 2011) and Indonesia (Darmawan, Putra and Wiguna, 2014), where estates and small farmers both play an important role in NR production, small farmers in Thailand are the main producers of NR, and produce more than 95 per cent of the total NR products (Burger and Smit, 1997; Jongrungrot, Thungwa and Snoeck, 2014).

The Thai NR industry has been successful in terms of production as well as the efficiency of its domestic markets. Regarding production, Thailand has a reputation, not only in terms of production volume, but also production yield. This is due to good support from government organisations. Although NR plantations have been in production for over a hundred years, not until the 1960s did the production start to increase significantly in terms of volume. This was as a consequence of the establishment of the Office of the Rubber Replanting Aid Fund (ORRAF) (Delarue, 2011). Thai NR production increased more than twenty-fold between 1960 and 2011 - from just 170,000 (Burger and Smit, 1997, p. 13) to over 3,573,000 tons (Weerathamrongsak and Wongsurawat, 2013, p. 52).

Another reason for this success is due to the efficiency of the domestic market. This because the majority of the raw NR value chain is in the hands of the farmers. It is well known that NR production in Thailand is due mostly to the work of small farmers. The links or networks of the market are considered vital to the integration of small, diverse producers as part of the domestic supply chain. The introduction of NR cooperatives and auction markets during the 1990s gave rise to the competitiveness of NR trading (Delarue, 2011). Although the cooperatives seem to have the some limitations in terms of their operational efficiency (as many of them later disappeared from the market), it is believed that they caused the NR market (with existing auctions) to become more competitive by stimulating trading competition with RBIs. As a consequence, the NR market in the south of Thailand has become a competitive one, dominated by small farmers as producers and RBIs providing the market links.

In the NR supply chain, RBIs play a crucial role in collecting rubber products from small farmers and reselling them directly to other supply chain players or via central markets

(Prommoon, 2009), as shown in Figure 1.1. Although the majority of NR is bilaterally traded between the players, these auction prices, which use first-price, sealed-bid auction mechanisms, are usually used as the reference price in local markets, and sometimes in international markets as well. In Thailand, it is believed that there are thousands of intermediaries buying NR products from millions of suppliers, but there is no official government statistics available on the exact number of them. The increase of fluctuations in price transmitted from the international futures markets causes a management problem in trading. However, price volatility is not the only problem intermediaries confront; they also face uncertain levels of production as well. This is because NR production decisions are made by millions of small producers and production also depends on weather conditions, especially in the rainy season.

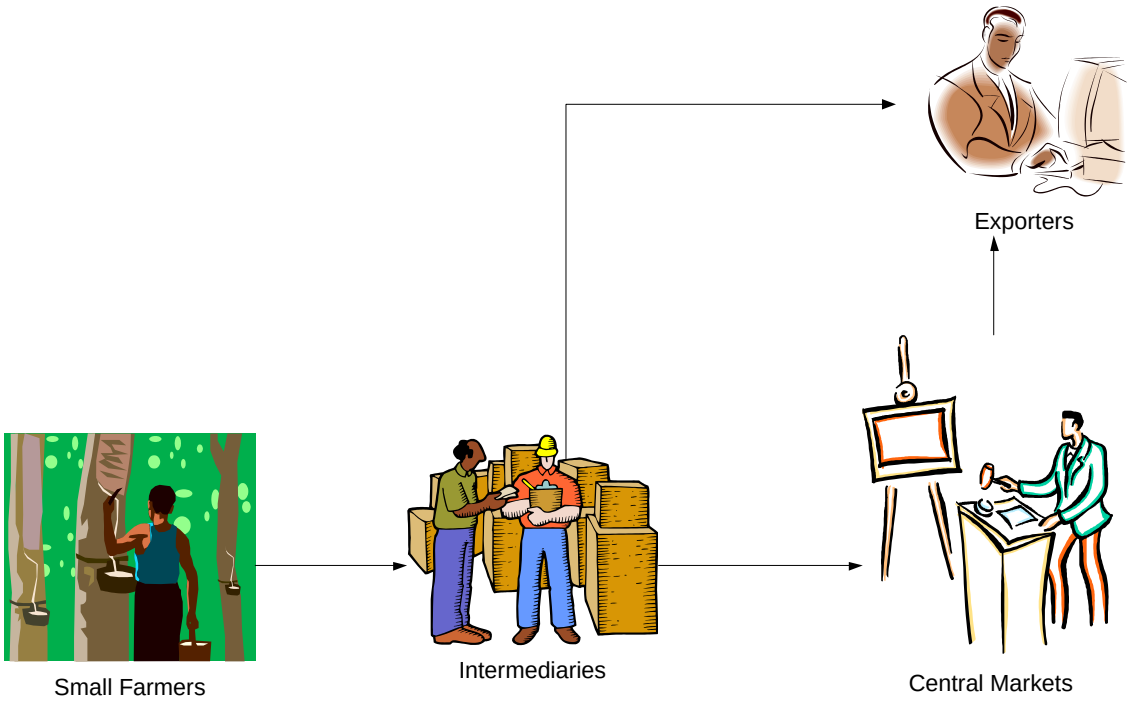


Figure 1.1: The natural rubber market in Thailand adapted from Prommoon (2009)

1.2.3 Price Risk Implications on Natural Rubber Supply Chains

In a similar way to other commodities such as crude oil and gold, NR prices have been increasingly volatile in recent years (Neupane and Calkins, 2013; Boonyanuphong and Sriboonchitta, 2014). Such price fluctuations result in the exposure of price risk to participants along NR supply chains (In, 2012). However, the complex nature of the NR supply chains makes these chains vulnerable, because (as mentioned in the previous section) they involve huge numbers of small farmers and just a few big industrial users.

This also includes a number of other players in the middle of the supply chain, such as business intermediaries and processors. Differences in accessibility to price risk instruments, management knowledge and business resources may lead to imbalance in PRM capability amongst NR supply chain players, even though they are exposed to similar price risks.

1.2.4 Personal Interest

The researcher grew up on an NR plantation. He experienced how NR was produced when he was a child as his family ran the plantation. He noticed that farmers' revenue from NR production is precarious, as price fluctuations, mostly with regard to low prices, lead to an insecure income. However, the importance of such an income is vital, since they commonly use NR income to support their children's education and their family's healthcare. From the researcher's point of view, PRM, especially for RBIs, is one of the ways that can be used to make the NR supply chain more efficient, which in turn leads to a sustainable income for NR farmers.

1.2.5 The Potential Value of the Research

Several benefits could potentially be derived from this research. Firstly, and perhaps the greatest potential value of this research, is that of gaining the greater knowledge of PRM practices, about which there is little to be found in academic literature (as outlined in Section 2.8.4). With regard to the implications of RBI practices, comprehensively understanding PRM practices from different points of views may facilitate new creative, innovative management ideas in many RBIs, especially small or novice RBIs. Furthermore, with regard to the fact that the NR market in the south of Thailand is well established and mature, PRM practices could in future be applied to new NR markets (in the north and northeast), when their market structure becomes similar. Additionally, the proposed conceptual framework of PRM practices may be transferred to other commodity markets trading with high volumes and low margins.

Moreover, as NR is one of Thailand's main industries, the other potential value of this research is the enhancement of understanding in the Thai NR supply chain. As RBIs play a crucial role in the efficiency of the NR supply chain as a whole, policymakers may formulate policy to improve its efficiency by understanding RBIs' PRM practices and supporting them. Furthermore, cooperation in the supply chain may result in a more efficient supply chain. It is suggested that the business partners of RBIs, such as

exporters and farmers, may cooperate better when they understand the situation of RBIs from their PRM practices.

In addition, the research may provide academic value to the field of strategic and operational management in the NR industry. The findings derived from this research may result in further research by the researcher himself or other researchers. Finally, this research allows the researcher to develop relevant research skills that can be used in a future career with possible benefit to Thai rubber industry.

1.3 An overview of the Study Context

Prior to considering the research aims and objectives, it is useful to provide a brief overview of NR and NR markets in Thailand. The following is the research context in terms of the NR industry in Thailand, the physical and futures market with regard to NR, market liberalisation, and the key role of NR to southern Thailand.

1.3.1 Natural Rubber

Although NR is able to be produced from a few crops, the *Hevea brasiliensis* tree is the only source that can produce economically (Phinyocheep, 2014). The tree is a perennial crop producing milky liquid, namely latex. Originally, NR trees came from the Amazon forest and the trees were called *Para,* this being the name of the city where NR products were traded (Barlow, Jayasuriya and Tan, 1994). They subsequently became economic crops used in a variety of applications in different industries (Castillo II and Paelmo, 2015), such as in the automobile and medical industries. Thousands of products, including hundreds of items of medical equipment, depend on NR for their production (Mooibroek and Cornish, 2000). Though there has been the emergence of synthetic rubber since WWII, NR still plays a vital role in the elastomer industry. In the tyre industry, which is the main consumer of NR, passenger car tyres are made of 50 per cent rubber, while those of lorries use almost 100 per cent rubber, whereas aircraft tyres are made entirely of rubber from NR (Cornish, 2014). Apart from being used in the tyre industries, NR is also used to produce other important products, such as hoses, conveyor belts, seals and gaskets, moulded rubber, wire and cable insulation, shoe heels and soles, sponge rubber, rubber tiles and rubber band products (Dick and Rader, 2014). Undoubtedly, NR is an essential material in modern industry.

Southeast Asia is the world's main production area as the weather is suitable for NR trees to produce a high yield. Thailand is now the largest NR producing country, as well as NR exporter, followed by Indonesia, Vietnam and Malaysia. All of them produce more

than two thirds of the world's NR (Ratnasingam, Ioras and Wenming, 2011). Therefore, NR is not only an important crop for Thailand but for the world as well.

The life cycle of NR trees, which can be produced economically, is around 30 years, including the period of gestation, which ranges from five to seven years (Meng and Liang, 2013). The process of producing latex is to tap into the bark and collect it later when NR trees stop producing. In order to obtain a high yield, the tappers have to stop tapping for a day after two or three days of production. This process requires a relatively high number of tappers to produce the high volume of products; NR production is therefore considered to be a labour intensive process. Moreover, due to disease the NR trees cannot be worked on a rainy day. Therefore, intermittent production is common in NR supply chains.

There are three main types of NR products used in the downstream: Unsmoked Sheet rubber (USS), Standard Thai Rubber (STR), and concentrated latex (Jawjit, Kroeze and Rattanapan, 2010). Approximately 70 per cent of NR production is consumed in the tyre industry (Weerathamrongsak and Wongsurawat, 2013; Sri Trang Agro-Industry Public Company Limited, 2015). This industry mostly uses two main types of NR products: USS and STR. Concentrated latex is used mainly in dipped goods industries, such as medical gloves and condoms.

1.3.2 Natural Rubber in Thailand

NR is one of the main economic crops of Thailand (Chawananon, 2014; Thongyou, 2014). Its export value is the highest amongst agricultural products. Over one million families (accounting for more than six million Thais) participate in NR industries (Nobnorb and Fongsuwan, 2015); this is about ten per cent of the Thai population (Delarue and Chambon, 2012).

- **History**

NR trees were first introduced into Trang province in southern Thailand from Malaysia by Phrayarasadanupradit, the governor, in 1899 (Udomjarumani, 2006) after the British brought 22 NR trees to grow in Asia in 1882 (Thongyou, 2014). NR plantations then gradually expanded in the south of Thailand. In 1949, the first government organization established to support the Thai NR industry was the Rubber Estate Organization (REO). Its main purposes are to operate NR plantations and produce the main NR semi-processed products such as RSS, STR and concentrated latex (Rubber Estate Organisation, 2015). In 1960 the Thai government established the ORRAF

(Udomjarumani, 2006), with the main purpose of supporting and controlling NR planting expansion and the collection of the relief fund or CESS (Thongyou, 2014). A few years later the Rubber Research Institute of Thailand (RRIT) was established, and was responsible for developing high yield rubber tree clones (Thongyou, 2014). As a result, Thailand has surpassed Malaysia to become the world's largest producer and exporter of NR since 1991 (Udomjarumani, 2006; Weerathamrongsak and Wongsurawat, 2013; Thongyou, 2014). The main production area is the south of Thailand, although it has expanded to lower yield areas in the north and northeast in recent years due to the saturation of the planting area in the south.

- **Thai Natural Rubber Production**

Thailand is the largest global NR producer in terms of volume (Jawjit, Kroeze and Rattanapan, 2010). Thailand's NR production has significantly increased in recent years. This is partly because new generations of rubber trees produce higher latex yields. The other reason is the increase in the area of NR plantations.

To meet the global demand for NR the government, in 2004, first introduced a campaign to encourage Thais to grow NR trees called *"one million rai"* (Weerathamrongsak and Wongsurawat, 2013) – equal to around 170,000 hectares. The main aim of this campaign was to encourage farmers to plant NR in a new area outside the south of Thailand, the traditional NR plantation area (Delarue and Chambon, 2012). Farmers who participated in the campaign received financial subsidies to grow new NR plantations. Moreover, another similar campaign of subsidised NR production, on 800,000 rai (just over 128,000 hectares), was promoted during periods of high prices in 2010 (Srang-iam, 2011).

The other source of the increase in NR production is the high price of NR products. After a period of low prices of around 20 Baht per a kilo in 2001, the price reached a peak of about 180 Baht in 2011 (Rubber Research Institute of Thailand, 2013). This factor encouraged more farmers to grow extra NR trees because they expected high returns. As a consequence, the area of NR plantation increased 60 per cent from 2004 to 2012 (Rubber Research Institute of Thailand, 2013). It should be noted that the NR plantation area in the south of Thailand seems to have reached saturation, as most of new NR plantations are found in the northeast and north of Thailand. NR trees in the latter are considered to provide lower yields than those in the former, as the climate conditions of these areas are less appropriate for growing NR trees than the south.

Regarding NR supply response in relation to price movements Much, Tongpan and Sirisupluxana (2011) found that, in Cambodia, farmers adjust their NR production in response to long-term price movement, but not for the short-term. This is similar to NR acreage response to price movement. Soontaranurak and Dawson (2015) pointed out that, in Thailand, the NR plantation area has a strong positive relationship with price movements in the long-term, but a weak relationship in the short-term. It seems possible that the delay in response of NR production and plantation comes from the fact that NR trees need a long time to reach maturity (six to seven years). Therefore, NR producers make their decision based on the long-term price trend. Moreover, in Thailand, the area of NR production also depends on government subsidies that encourage farmers to diversify from traditional crops into NR (Soontaranurak and Dawson, 2015).

- **Thai Natural Rubber Consumption**

Although Thailand is the biggest NR producer in the world, the consumption of NR in Thailand is just a small proportion of the production. It has slightly increased from 10 per cent in 2000 to 13 per cent in 2012 (Rubber Research Institute of Thailand, 2013). However, when considering the domestically consumed volume of NR it is apparent that 2012 was double that of 2000. This is because both domestic consumption and production have increased. Moreover, most of the production is exported as a semi-processed product for further use. The reason for this may be as a consequence of the imbalance between knowledge and resources in the upstream, midstream and downstream of the NR supply chain.

- **Thai Natural Rubber Export**

The export value of semi-processed NR products, accounting for over 80 per cent of the total NR export, reached a peak of 383 billion Baht (approximately equal to 7.6 billion Pounds) in 2011 (Rubber Research Institute of Thailand, 2013). This is the result of the increase in NR prices and production. In 2012, the export value went down to around 270 billion Baht (approximately equal to 5.4 billion Pounds) as a result of lower prices – even though the export volume increased from 2011. In terms of volume, Thailand exports approximately one third of the global trade.

1.3.3 Stakeholders in Thai Natural Rubber Supply Chains

When considering the Thai NR industry and the roles played in the supply chains, there are four major players, the details of which are as follows.

- **Producers**

As previously mentioned, unlike in other NR producing countries (especially the new ones), the majority of NR producers in Thailand are small producers. They are fragmented, resulting in it being difficult, or even impossible, to control the supply. This makes the Thai NR supply chain more complex than those countries that have estate producers.

The reasons behind the success of Thailand becoming the world's largest NR producer from such small producers come from the support of the government organisations (Weerathamrongsak and Wongsurawat, 2013): the RRIT and ORRAF. The RRIT helps mainly in respect of technology, marketing and NR tree development (Viswanathan), whilst the ORRAF supports the expansion of NR cultivation and replanting old NR trees (Srang-iam, 2011). Therefore, small farmers can access the technology, knowledge and support they need.

The high percentage of raw NR value chain or almost 90 per cent of the exporting value belongs to Thai farmers (Prommoon, 2009), due to low profit margins of other players (RBIs and exporters). This is different from other agricultural commodities, such as coffee, cacao and tea. However, like other commodities in developing countries, local trading prices depend highly on international futures exchange markets. Therefore, farmers tend to be unable to control their incomes, as they are unlikely to participate in the international markets.

- **Rubber Business Intermediaries**

RBIs play a vital role in linking millions of farmers to hundreds of processors and exporters. Therefore, the efficiency of the NR supply chain depends on their capability in performing their functions: buying NR products from farmers and reselling them to processors. However, the nature of their businesses depends on margins between buying and selling prices, which are normally relatively small. Shattuck (2013) found that local RBIs in the south of Thailand usually set margins between 0.50 – 1.00 Baht/kg. It means that selling profit margin is as low as one half, and up to two per cent out of the selling price (when the selling price is between 50 – 100 Baht/kg). Considering the resources for managing price risk, they are inferior to those in developed countries. Their businesses may be severely impacted by recent price fluctuations, which lead to instability in supply chains as a whole.

- **Exporters**

In 2012, there were 455 and 423 NR processors and exporters, respectively, according to the Rubber Control Act 1999 in Thailand (Rubber Research Institute of Thailand, 2013). The reason why the number of both NR processors and exporters is similar is because, typically, NR processors are also NR exporters. Additionally, a large exporter may have several branches of processors located in different places, which results in a smaller membership of the two Thai NR exporter associations: the Thai Rubber Association (TRA) and the Thai Latex Association (TLA).

The TRA was established in 1951 and aims to promote cooperation amongst Thai NR processors and exporters in order to gain a competitive advantage from facilitating trading support in domestic and international NR markets (Thai Rubber Association, 2012). Its office is located in Hat Yai, Songkla province in the south of Thailand. The TRA accounts for the majority of total Thai NR exports of the three variety of grades of semi-processed NR products: RSS, STR and concentrated latex (Thai Rubber Association, 2012). There originally were 15 members. However, the number of TRA members increased to 57 in 2015 (Thai Rubber Association, 2015a).

Unlike the TRA, which focuses on all three primary NR products, the TLA focuses only on concentrated latex. The TLA was officially registered as an association in 1995 (Thai Latex Association, 2013). In 2013 the TLA had 80 members and its office is situated in Hat Yai, Songkhla province, the same district as the TRA. This is because Hat Yai is considered to be the NR capital of Thailand. Moreover, most TLA members are in the south of Thailand, which is the main NR production area, and close to Malaysia, the biggest importer of concentrated latex from Thailand.

It is interesting to note that although there are a few big NR exporters in Thailand, the gross profits of one of the big exporters was less than six per cent in the last three financial years (2012, 2013 and 2014) (Sri Trang Agro-Industry Public Company Limited, 2015). This indicates that the NR market is highly competitive.

- **Government Organisations**

Three main government organisations are involved in the NR industry in Thailand: RRIT, ORRAF and REO (Viswanathan). The three, working under the Ministry of Agriculture and Agricultural Cooperatives, are considered the key success factor in driving the expansion of NR plantations and increases in NR yield (Thongyou, 2014). Although they have different primary roles in supporting NR production, the duplication of some of their

tasks has led to criticism, such as the development of local markets (Thongyou, 2014). However, in July 2015, the Thai government has officially merged the three organisations into the Rubber Authority of Thailand, so they can serve Thailand's NR industry more effectively and efficiently (Thai Rubber Association, 2015b).

1.3.4 Physical Markets of Natural Rubber in Thailand

There are two main types of market channels in trading NR products in the south: central or direct markets. Most of them are privately traded between NR buyers and sellers, even though trading via the central markets generally achieves higher prices (for the details of individual markets see Appendix A).

1.3.5 The Futures Exchange Market of Natural Rubber

Three main futures exchange markets physically trade prices of NR in Thailand influenced by these (for futures exchange markets of NR see Appendix B).

1.3.6 Thai Natural Rubber Market Liberalisation

Even though the Thai NR market is considered a free market, on some occasions the government has decided to intervene in the market (for more details see Appendix C).

1.4 Research Aims and Objectives

In this section, the aims and objectives of this research, which are relevant to PRM strategies and practices, are defined as follows:

Research Aims

- To explore the PRM strategies adopted, and to understand the PRM practiced by RBIs when it comes to managing their business in the south of Thailand.

Research Objectives

1) To explore PRM strategies adopted by RBIs in order to manage their business, taking into account price volatility.
2) To identify factors influencing risk-taking decisions in terms of NR trading practiced by RBIs.
3) To investigate how RBIs select market channels to sell their NR products, as well as factors influencing this selection.

4) To develop a conceptual model in order to understand the complexity of price risk in an RBI context, and their management in terms of PRM strategies, decision-making in terms of risk-taking and market channel selection.

1.5 Structure of the Thesis

The thesis is organised into eight chapters.

Chapter One, the introduction chapter, contains the justification for this study in terms of the rationale for the study, comprising the researcher's personal interest, the importance of NR as an economic crop for southern Thailand, the vital role of RBIs in the NR supply chain where small farmers dominate as producers, and the implications of price volatility in the global market. Then, a brief overview of the NR market in the south of Thailand is provided. Finally, the aims and objectives of this thesis are stated.

Chapter Two is devoted to the literature review relating to the management of price risk. Three aspects of PRM are included in this study: PRM strategies, risk-taking decisions and market channel selection. Moreover, there are seven factors that are used for price risk analysis in a trading context: available PRM instruments, selling market channels, transparency and transmission of price information, pricing methods, price forecasting methods, futures market and the technology used by commodity supply chain players. Eventually, the gap in knowledge, the PRM practices in an RBI context, is identified.

Chapter Three contains the research paradigm, methodology and methods, and the justification for adopting them throughout this research design and its implementation. To gain an in-depth understanding of PRM practiced by RBIs, the interpretivist paradigm was adopted and qualitative data was collected, mainly from semi-structured interviews complemented by short questionnaires and documentation. This research adopted a sectoral study approach, adopting the principle of the case study as the research participants were 24 RBIs from different businesses but who all have the same role (that of an intermediary) in the NR supply chain. The template analysis method was used in terms of textual data analysis supported with the use of NVivo software. This research was assessed in terms of its quality through the use of trustworthiness criteria, and followed the ethical research guidelines of the University.

Chapter Four provides the research findings in the context of the rubber intermediary business in terms of the market structures of five different kinds of NR businesses. Furthermore, the role of RBIs in the NR supply chain is identified. It consists of seven

types of provided services: sourcing, marketing, grading, processing, finance, transport and management of the balance of the NR supply.

Chapter Five delivers the research findings relevant to price risk in the NR industry, its causes and its implications on five types of RBIs in the south of Thailand. These findings include the characteristic of NR price risk taking and market transformation based on RBIs' perspectives. Moreover, the factors and the NR supply chain stakeholders influencing NR prices are identified. Finally, the implications of NR price volatility are exemplified.

Chapter Six provides the main findings with regard to PRM practices in the context of RBIs. PRM strategies used in trading NR by RBIs are identified, as are the exemplified factors that influence the selection of a particular strategy. One of the main challenging issues in PRM in terms of decisions in risk-taking is investigated in order to gain an in-depth understanding of how RBIs make their decision to store, market their products or hedge the price risk. To understand the price risk context that RBIs operate in with regard to their business, seven aspects of business circumstances are presented: PRM tools, market channels, price information, pricing methods, price forecasting methods, futures market and information technology use.

Chapter Seven discusses the main findings of PRM practiced by RBIs. Three aspects of PRM derived from the research findings are discussed in this chapter. These are PRM strategies, risk-taking decisions, and the selection of market channels. This also includes the discussion of factors impacting on such management aspects. In addition, the price risk context of rubber intermediary business based on the seven perspectives is also discussed. Finally, the conceptual model of understanding PRM practices in the context of RBIs is proposed in line with the aims of this research.

Chapter Eight contains the conclusions of this research. The main findings of this research are presented along with the research questions and the research aims and objectives, to demonstrate that they are all addressed. The contributions of this research to knowledge and its implications are also revealed in this chapter. Finally, the limitations of this study and recommendations for future research are stated.

1.6 Chapter Summary

This chapter provides the introduction to this research. The rationale for this study is illustrated, including the phenomenon of price volatility, the importance of the NR industry, particularly in the south of Thailand, and the vital role that RBIs play in the NR supply chain. Finally, the organization of the thesis structure is explained and the overview of each chapter is provided.

In the following chapter, literature relating to commodity PRM is presented and critically evaluated. This, combined with the literature evaluated in Appendix D on *'Commodity Price Risks and Its Implications'* will be assessed in combination, through the summary to Chapter Two so as to identify the gap in knowledge that potentially exists, and in doing so, identifying the principle area of interest that will be explored within the primary research that underpins this study.

Chapter 2 Commodity Price Risk Management

2.1 Introduction

This chapter moves onto the central part of this research which is the review of the literature relevant to the management of commodity price risks with regard to PRM strategies, risk-taking decisions and market channel selection. Moreover, to understand price risk environments, literature relating to PRM instruments, market channels, price information, pricing and price forecasting methods, and futures market and technology use is reviewed. Finally, the gap in knowledge which has led to this research is identified as a summary to the literature review in this chapter and Appendix D. Appendix D provides background and context through the literature on price risk and its impact on commodity stakeholders, by emphasising the importance of the issue of price risk.

This chapter's outline is as follows. It begins with a review of the literature on PRM in Section 2.2. The literature involving the PRM strategies used in commodity trading is considered in Section 2.3, before moving to Section 2.4 with a consideration of the literature relating to decision making in terms of risk taking, which is relevant to timing when it comes to buying and/or selling commodities taking price risks into account. Section 2.5 is a review of the literature on selecting market channels in order to sell commodity products. The following Section 2.6, considers seven perspectives explaining the context of price risk taking. Such perspectives allow navigation towards the fundamental idea of price risk in a particular trading environment. Section 2.7 introduces a conceptual framework derived from the literature review. Although research in the context of financial sectors is particularly extensive, there is also existing some research into PRM practices in the context of other players in commodity supply chains, including producers and commercial traders. These issues are addressed in Section 2.8. Moreover, the knowledge gap with regard to PRM practices is identified in this section, given the relative lack of research into the context of RBIs. The chapter is summarised in Section 2.9.

2.2 Price Risk Management

Prior to reviewing the literature in relation to PRM, it is necessary here to clarify exactly what is meant by price risk. In this section, the differences between risk and uncertainty are defined. Moreover, the definitions of risk attitude and perception are introduced.

Finally, risk management in practice is explained in terms of attitude and perception of decision makers, comparing this to the model of expected utility in economics.

2.2.1 Risk and Uncertainty

Risk is different from uncertainty by its ability to be quantified in terms of objective probability. Risk variables can be identified in the form of objective probabilities whilst those relating to uncertainty are unknown (Knight, 1964). Instead of being considered in an objective way, uncertainty can be defined as a subjective probability form. However, both risk and uncertainty make the managerial situations more complex and unclear.

While rational decisions require a certain environment in order to form the problem into solvable mathematical formulae, risk and uncertainty drive it away. In the nature of vague situations, the values of related variables are difficult to determine. This means that the managerial situation is, often, not pictured clearly. Therefore, it provides a problematic solution for which to work to offer a solution to the problem.

"People differ in the way they resolve decisions involving risk and uncertainty, and these differences are often described as differences in risk attitude" (Blais and Weber, 2006, p. 33). It is a factor internal to the decision maker that can explain to what extent one prefers to take a risk. There are three types of personal risk attitudes - risk aversion, risk taking and risk neutrality. The definition of each risk attitude is defined as follows.

> *"A risk-averse attitude is the attitude of an individual that he or she will be unwilling to accept a risk in the following situation: When presented a choice as a trade-off between a gamble and a sure thing of equal expected value, the risk-averse individual will be more likely to take the sure thing and not take the gamble" (Mazur, 2009, p.998).*
>
> *"A risk-seeking attitude on the part of an individual is the attitude that he or she will be willing to accept a risk in the following situation: When presented a choice as a trade-off between a gamble and a sure thing of equal expected value, the risk-seeking individual will be more likely to take the gamble" (Mazur, 2009, pp.998-999).*
>
> *"A risk-neutral individual would be neutral regarding the choice, that is, he or she would be neither risk seeking nor risk-averse" (Mazur, 2009, p.999).*

On the other hand, *"Risk perception refers to people's subjective impression of riskiness"* (Weber, 2009, p.1009). Unlike risk attitude that is considered to be a trait of an individual, risk perception is one's interpretation of the level of risk from external environments. The perception is one of these factors can be used to explain why individuals make different decisions under the same circumstances (Pennings and Garcia, 2004). This factor also

drives the changes in risk preferences and explains that investors who have the same risk perception tend to select the same risky choices (Weber and Milliman, 1997).

2.2.2 Risk Management

In recent years, there has been an increasing amount of literature published on risk management. However, there are several different definitions of "*risk management*" according to different research fields. One definition in relation to the process of decision making notes that:

> *"Risk management is the making of decisions regarding risks and their subsequent implementation, and flows from risk estimation and risk evaluation" (The Royal Society, 1992, p. 3).*

Other definitions are related to particular fields of studies, such as software (Wiegers, 1998), construction (Eskesen *et al.*, 2004) and supply chain analysis (Zsidisin, 2003; Ellis, Henry and Shockley, 2010). Ho *et al.*'s (2015) comprehensive review of supply chain risk management defines the process as:

> *"An inter-organisational collaborative endeavour utilising quantitative and qualitative risk management methodologies to identify, evaluate, mitigate and monitor unexpected macro and micro level events or conditions, which might adversely impact any part of a supply chain" (Ho et al., 2015, p. 6).*

According to Ho *et al.* (2015), supply chain risk can be classified into five types of risks: macro, demand, supply, manufacturing, and infrastructural. "*Price risk*", the main focus of this research, belongs to financial risk in the infrastructural category. Therefore, the process of PRM in this research refers to supply chain risk management, which can be divided into four stages: identification, assessment, mitigation, and monitoring. The supply chain risk management process is used as a conceptual framework to review the relevant literature and to identify the focus of this research.

Regarding risk identification, a considerable amount of literature emphasises the importance of price risk in commodity supply chains. Banterle and Vandone (2013) note that the agricultural commodity prices have become volatile in recent years, resulting in market participants experiencing difficulties in their trading activities. Berling and Rosling (2005) point out that in inventory management, though the degree of impact on a particular product is unclear, price risk is considered to be the main risk. Deng, Zhang and Zhao (2009) add that price risk is not only considered the major risk for investors, it is also the main focus of global investment regulators. Tang (2015) indicates that price risk is now one of the major recognised risks in the restaurant industry.

In terms of risk assessment, literature focusing on commodity prices has significantly increased in recent years. Perhaps this is the consequence of the uncertain business climate following the financial crisis in 2008. For instance, Sainidis, Robson and Heron (2013) note that manufacturers located in the UK and classified as SMEs are the most negatively affected by the increasing cost of production compared to the flexibility of production, performance of product delivery and quality of products. These negative effects originate partly from the input costs of raw materials that have risen since 2008. A considerable amount of literature has been published on price risk modelling based on quantitative methods (Ni *et al.*, 2012). Moreover, there is no consensus on the quantitative-based measurement of price risk, for example, the method that focuses on both negative and positive aspects (Capitani and Mattos, 2012).

This research does not seek to quantitatively measure price risk. It aims instead to explore price risk qualitatively in terms of price risk implications, market structures, factors and players influencing price movements, PRM tools, market channels, price information accessibility and transmission, pricing and price forecasting methods adopted in the market and the futures market and Information and Communication Technologies (ICTs) use. As a result, a clearer picture of price risk in the market will be shown based on this qualitative research.

With regard to risk mitigation, there are four major risk mitigation measures: risk avoidance, risk reduction, risk transfer, and risk retention (Aven and Kristensen, 2005; Hlaing *et al.*, 2008; Matulevicius, Mayer and Heymans, 2008). In agricultural commodity markets, much of the current literature on price risk mitigation pays particular attention to risk transfer using market-based tools e.g. Tomek and Peterson (2001), Schaffnit-Chatterjee *et al.* (2010), Gemech *et al.* (2011), Yaganti and Kamaiah (2012) and Revoredo-Giha and Zuppiroli (2013). Though there have been questions about some tools' performance (such as the use of futures contracts) in terms of profitability, Gemech *et al.* (2011) argue that using such tools results in other non-financial benefits, such as the enhanced capabilities available in resource allocation. Moreover, there is an issue concerning the futures market's efficiency regarding the hedging purpose. In her detailed study, Newman (2009) finds that a variety of strategies of PRM, such as forward contracting and back-to-back selling, have been adopted by coffee supply chains in Uganda and Tanzania, and she raises the issue of inequality of access to PRM tools between players in the supply chains. The current research focuses mainly on the risk mitigation stage in relation to PRM strategy in the Thailand NR industry in the context of RBIs. The PRM strategy is, later, divided into the stages of formation and implementation (risk-taking decisions and market channel selection).

As pointed out above, the final stage of the risk management process is risk monitoring. *"Risk monitoring can be used to make sure that risk management practices are in line with desired practices"* (Al-Tamimi and Al-Mazrooei, 2007, p. 402). A salient example of the common use of risk monitoring can be found in banking. Rosman (2009) notes that risk monitoring is a vital process that helps banks guarantee that effective risk management is implemented. Butt, Nazir and Daniel (2012) also find that risk monitoring is considered a crucial instrument of practical use in Pakistan's banking sector. Although risk monitoring is an important component of risk management, this research does not seek to study this process, as the majority of rubber intermediary businesses are independent and are categorised as small businesses.

2.2.3 Price Risk

Before analysing PRM, which is the focus of this research, it is essential to understand the concept of "*price risk*". Price risk has been defined in various ways within in the literature. There are three main definitions of price risk, as outlined below.

The first definition is: *"Price risk is the risk of variability in prices of underlying assets or financial variables"* (Shah, 1996, p. 22). In other words, price risk is the change in price in terms of relative time between, for example, the current and previous prices. One of the advantages of this definition is that it is objectively measurable.

The second definition is: *"... price risk is the result of deviation in prices from their expected trend and hence is essentially the result of uncertainty due to price volatility"* (Gemech *et al.*, 2011, p. 54). This definition corresponds with that of Banterle and Vandone (2013). As a consequence, the degree to what levels of price risk individuals are exposed to tends to differ from person to person. This is because an individual's perception in price movement is considered subjective.

The third definition is the potential of adverse price movements that result in negative business outcomes after a risk–taking decision has been made (Simpson, 1997; Hongxia, Yinsheng and Hongpeng, 2011; Läänemets, Viira and Nurmet, 2011). Similar to that of the second definition, the extent of the price risk is context dependent. In other words, it depends on the decision made by a particular person, which is likely to vary amongst different decision makers.

This research redefines the concept of price risk using a combination of the three definitions outlined above. This new definition can be articulated as *"the risk associated*

with impact from positive and negative NR price movements on rubber intermediary businesses".

2.2.4 Price Risk Management Theory and Practices

The expected utility theory explains how individuals can manage price risks in a rational fashion. However, it is found that practice does not always follow theory. This may be because individuals have psychological reasons that leads to decision making based on an individual's experiences received from occurring events rather than from statistical description models which include both occurring and non-occurring events, especially, those considered rare or *"one-offs"* (Weber, 2006). Individuals who make decisions based on their experiences are likely to underestimate rare events, while others who make decisions based on descriptive models are likely to overestimate them (Hertwig *et al.*, 2004). Another alternative reason which explains why people behave differently from the expected utility theory in terms of PRM, are the limitations of decision makers' knowledge or resources in PRM. The next section of this chapter reviews the literature on PRM, both from theoretical and practical perspectives.

2.2.4.1 ***Price Risk Management in Theory***

The expected utility theory is an instrument for choosing amongst available choices under risk based on the utility and probability of individual choice. This decision tool is commonly used in several ways in different disciplines; for example as a normative model in finance and economics, a descriptive model in psychology, and a prescriptive model in management science (Schoemaker, 1982).

In portfolio theory, risk taking behaviours are examined in a rational way. An individual's risk behaviour is determined by expected returns calculated from the log function of returns, expected risks derived from the variance of past time series relating to price, and risk attitude defined as a convex function of risk takers and a concave function of risk-averse investors (Markowitz, 1952). The theory explains that investors' decisions whether to invest in a security are based on the objectives of maximising profit or minimising risk. This theory is commonly used within investment communities and by economists.

However, there are some limitations in explaining real behaviour when people make their decisions in practice. Risk behaviour at the individual level is not consistent with the expected utility for various reasons. For example, an individual does not understand the problem that confronts him or her completely, as in the expected utility theory.

Furthermore, the way an individual interprets probability information in practice is different from how they do it in theory (Schoemaker, 1982).

2.2.4.2 *Price Risk Management in Practice*

In reality, people tend not to rely only on rationality in making their decisions. Prospect theory states that people are likely to feel more losses than gains for the same magnitude of results. They use the expected point rather than a neutral point in the expected utility theory as a reference point to separate the respective domains of losses and gains. Moreover, people are likely to be loss aversive, that is they refute the state of loss and taking risks; that is they are risk-seeking when they feel losses, and risk-aversive when they feel gains (Kahneman and Tversky, 1979).

From a psychological perspective, risk decision behaviours are determined by the individual's risk feelings. This can explain why different individuals may have different risk-taking behaviours in the face of the same situation. Individual risk attitudes, risk perceptions and value expectations are the factors that drive that person's risk preference behaviours. Furthermore, changes in risk-taking behaviours are relevant to changes in risk perception, but not to changes in risk attitude (Weber and Milliman, 1997).

The changes in risk risk-taking behaviours and their relationship to changes in risk attitude, risk perception and value expectation were studied from a financial perspective over the period of the global economic crisis in 2008 (Weber, Weber and Nosić, 2012). During this period, there was a good opportunity to investigate the changes occurred in investment behaviours due to the volatile business environment. The results show that risk-taking changes according to changes in the perception of risk and return expectations, while investors' risk attitudes over the same period did not change. In other words, the changes in business circumstances which are external factors as perceived by investors, drive their risk-taking behaviours. Moreover, it is worth noting that it is not necessary for their perceptions towards risk to be accurate. This is an important issue because incorrect risk perception may drive wrong risk management behaviours which, in turn, may lead to incurring losses in business.

This next section of this literature review provides a brief overview of price risk and its management. It then goes on to assess PRM strategies.

2.3 Price Risk Management Strategies

In recent years, there has been an increasing interest in PRM as a consequence of the volatility of commodity markets (Zsidisin and Hartley, 2012; Revoredo-Giha and Zuppiroli, 2013). As a result, price risk has become one of the main issues, if not the most important issue, in agricultural commodity trading, ranging from producers (Banterle and Vandone, 2013; Broll, Welzel and Wong, 2013; Sherafatmand, Yazdani and Moghaddasi, 2014), to commercial traders (Berling and Rosling, 2005), to financial investors (Deng, Zhang and Zhao, 2009), to users (Tang, 2015) and consumers (James, 2007). A significant issue is how stakeholders who are exposed to risk manage it (Morgan, Cotter and Dowd, 2012). In this section of the review, some important literature in relation to PRM strategies will be assessed.

PRM strategies play a crucial role in commodity trading as they are the key determinant of business performance (Newman, 2009; Ni *et al.*, 2012). There are a variety of PRM strategies that supply chain players may be able to select from, for instance, stocking, back-to-back selling, forward selling, or a mix of these to create a portfolio management. However, the formation of management strategies in small business tends to be not explicit (d'Amboise and Muldowney, 1988). Therefore, to investigate it is considered a challenging task.

Different PRM strategies may have different advantages and disadvantages. Therefore, adopting a particular strategy may lead to different consequences for business performance. In other words, selecting appropriate management strategies from the trade-off of costs and benefits of possible alternatives is a difficult job (Tomek and Peterson, 2001). Neyhard *et al.* (2013) point out that traders need to know the information relating to different PRM strategies, especially their costs. Tang (2015) adds that a particular strategy's performance tends to fluctuate depending on the business circumstance. Therefore, this section discusses both the advantages and limitations of given PRM strategies.

Types of Price Risk Management Strategy

This section reviews the five selected PRM strategies. The advantages and limitations of each individual strategy will be clarified.

- **Stock Holding**

One of the common trading methods used in commodity markets is holding the stocks for reselling later (Joseph, Irwin and Garcia, 2015). Stock holding is the obvious strategy

chosen by physical commodity traders and their main business activity is sourcing and supplying. When they buy commodity products from their suppliers without hedging the price risk, they are considered to be stock holders. As a result, the stock holding strategy is one of the main commodity trading strategies.

Advantages

The obvious benefit of stocking commodity products is that there is no need for PRM tools in its implementation. Traders are able to balance supply when there is plenty, such as harvest or peak producing seasons, and then resell during times of less supply. With this strategy, stock holders may gain the advantage of better prices. Therefore, they may gain profits from price differences subtracted from costs of storage (Joseph, Irwin and Garcia, 2015).

Disadvantages

Apart from the storage costs of the stock-holding strategy (Rampini, Sufi and Viswanathan, 2014), there are other issues that also need to be considered. The first issue is the need for warehouse capacity to maintain the quality of products in the physical holding (Anastassiadis *et al.*, 2013). Moreover, this may include warehouse insurance for safety reasons. Finally, there is one of the most important issues in commodity trading, that is merely price volatility. There is no guarantee of a better price after the period of buying and storing commodities (Ramanujam and Vines, 1990).

- **Back-to-back selling**

The ideal PRM strategy for a risk-averse trader is back-to-back selling or full hedging. In order to prevent future price changes, commodity market participants are able to use a natural hedge (sell their stock holding) or PRM tools to fix prices. As a consequence, using PRM tools in hedging is considered a provisional trading mechanism for a physical market (Taušer and Čajka, 2014).

Advantages

One of the advantages of managing price risk by back-to-back selling is to lock in a profit of trading. This is practical when the price is higher than what is expected, relative to the known producing costs (Kim, Brorsen and Anderson, 2010). As a consequence, the business is able to capture the selling opportunity if the trading is profitable.

Another advantage of the strategy is to make the business cash flow stable for the future management (Dinica and Armeanu, 2013). Although some commodity products are

unable to be resold immediately, hedging the price risk via PRM tools in futures exchanges is one of the potential ways to transfer the risk to other parties. This is because the price of derivative contracts, such as futures or options contracts, are related to those in cash markets (Chung-Chu *et al.*, 2012).

Disadvantages

One of the most significant current discussions in PRM is the hedging performance of PRM tools, such as futures contracts. In the case that commodity products cannot be sold immediately, it requires proper price risk hedging tools such as futures markets. Though price movements between cash and derivative markets are expected to be consistent (Chung-Chu *et al.*, 2012), in the real world of trading, the price movements between the two markets may be varied (Dinică and Armeanu, 2014). Therefore, back-to-back selling may not be perfectly implemented in this case. Moreover, using PRM tools means incurring transaction costs. Therefore, the trade-off between advantages and incurred costs needs to be considered in details, particular where margins are small

- **Forward Selling**

Forward selling takes place when market participants sell commodity products in advance before they produce or buy them, or use PRM tools to hedge price risk in quantities that are higher than that of their holding. Forward, futures or options contracts are common PRM tools used to employ the forward selling strategy.

Advantages

Forward selling is beneficial during periods of depressed prices. Selling commodity products in advance of such periods of time means the opportunity to sell them in higher prices (Henderson, Hobson and Kentwell, 2002) and buy them later at lower prices to generate extra profits for traders in addition to the usual profit margins. Moreover, traders may gain indirect benefits in business competition by sourcing at above-market prices that their competitors may not be able to compete with.

In addition, forward selling by physical traders may affect price movements in their favour. According to Chen *et al.* (2014), previous trading may impact on subsequent prices of a particular asset. Therefore, forward selling might result in declined prices in the futures markets if business partners hedge derived price risk from forward contracts by selling in these futures markets.

Disadvantages

Selling in advance without holding physical stocks may expose traders to the risk of making losses from increased prices. Moreover, forward contract arrangements usually come with costs, as their business partners may transfer the price risk to other parties with other financial tools, such as futures or options contracts. Such tools incur transactional costs alongside occasional maintenance costs that are often, in turn, passed to forward contractors.

- **Negotiation**

"Negotiation is a normal approach to determine a purchase price in a supply chain contract. In a bilateral negotiation process, the contract (purchase) price is negotiated between a buyer (retailer) and a seller (supplier)" (Moon, Yao and Park, 2011, p. 413). Negotiation is a PRM strategy employing market power in supply chains or relationships with business partners to gain a competitive advantage in terms of price. Moreover, market information also plays an important part in negotiation (Wilcox and Abbott, 2006).

Advantages

In an emerging market where formal PRM tools are scarce or even non-existent (Capitani and Mattos, 2015), the informal trading or hedging mechanism plays a vital role in PRM. To access such tools, negotiating ability is a key success factor. As a consequence, negotiations both in better trading prices and in gaining PRM tools represent certain of the ways to gain a competitive advantage in trading in such a market.

Disadvantages

Bargaining power is the key factor of the negotiating strategy and, in commodity trading, trading volume tends to relate to such market power. As a result, small or start-up businesses are less likely to be able to adopt this strategy. Therefore, only large traders who have bargaining power are able to adopt the strategy. Moreover, traders require good negotiating skills and comprehensive market information to gain a better position in negotiation (Blount, Thomas-Hunt and Neale, 1996).

- **Portfolio Management**

Rather than using market power or relationships, traders may adopt a portfolio management strategy in managing price risk utilise market-based PRM tools to gain a competitive advantage in the market. This strategy requires competency in

understanding market prices as it is seeking to optimise profit or minimise price risk from market movements.

Advantages

Utilising several strategies i.e. a portfolio of activities gives benefits in several aspects. Maximising profits from a variety of price movements is ideal for portfolio management, for example stock holding when prices are rising and forward selling when prices are falling, although it is difficult to implement in practice as price movements are difficult to forecast. The finance industry has paid much attention to seeking the most profitable techniques for many years. For example, Hammoudeh, Malik and McAleer (2011) indicate that traders can be guided by VaR, one of the techniques used to measure price risk, in order to assess the most appropriate PRM strategy for a particular business environment.

Disadvantages

One of the main issues in adopting portfolio management in practice is the lack of PRM tools to facilitate trading. It also requires each tool to work efficiently. This seems to be an issue during price volatility periods where price co-integration between spot and futures seems to be broken up (Taylor, Tonsor and Dhuyvetter, 2013) or forward contract default might have taken place (Jones *et al.*, 2007).

2.4 Risk Taking Decisions

It is evident that commodity trading involves taking risky decisions. For example, Williams and Malcolm (2012) noted that decision-making in wheat farming, particularly trading on free markets, is considered to be challenging. However, farmers have to make such decisions regularly (Kim, Brorsen and Anderson, 2010). Pennings *et al.* (2008) argue that a commodity trading decision in practice is highly complex as it involves many decisions, and this results in difficulties in searching for relevance information and evaluating every decision due to humans' cognitive limitations. Consequently, risk-taking decisions are an important component in commodity trading. Traders make risk-taking decisions on a daily basis, or even several times a day, either to incurring risk or transfer this risk. However, to make the right decision to buy, sell or stock commodity products is still a puzzling task.

Making decisions is an everyday life activity, but in business it seems to be different, as one decision might determine whether or not the business can survive (Turban, Delen and Sharda, 2013). There are different levels of importance for decision-making in

business, ranging from operational and tactical, to strategic decisions that are relevant to safe or risky and uncertain environments (Turban, Delen and Sharda, 2013). Decision-making under risk is one of the most active research areas in decision-making. This may be because it is challenging to find a solution. Wang *et al.* (2010) pointed out the importance of decisions in optimising the management of price risk, and also found that such solutions depend on the type of market, the models used for hedging and the time length.

Decision-making is not always rational, as some decisions have to be made with limited time and resources (Simon, 1955). In practice, intuition plays a vital role in decision-making under risk (Gehner, Halman and de Jonge, 2006). Moreover, for a situation that is uncertain or ambiguous, the rational way of thinking cannot be applied easily and intuitive decision-making seems to be the favoured choice. When a decision is made in uncertain circumstances, there is no consensus as to its effectiveness. For instance, in commodity markets, Wang, Wu and Yang (2015) argued that optimal decision-making in hedging price risk is still inconclusive, even though there is a large volume of published studies on this subject. On such occasions, when the results of rational decisions are not always reliable, intuitive decisions (heuristics) are considered as an alternative (Gigerenzer and Selten, 2002). However, intuition itself also has some limitations. Thus, the appropriate solution for decision-making in uncertain business environments may fall between a combination of rational and intuitive decisions, which can complement each other's limitations.

In the same vein, with Simon's bounded rationality, Gigerenzer and Goldstein (1996, p. 650) argued that *"Humans and animals make inferences about the world under limited time and knowledge."* In contrast to the prospect theory, people's expertise differs as we learn by interacting with environments and develop heuristics (Gigerenzer and Selten, 2002). According to Shanteau (1992, p. 263), *"The competence seen in experts depends on having stable strategies developed in response to their environment."* However, unlike safe environments, those considered as risky business environments, include those subject under price risk, it is not easy to evaluate the effectiveness of the associated decisions. As a result, it may be difficult to learn from such environmental feedback.

In recent years, a considerable amount of literature has been published on normative models in hedging optimisation or market price analysis (Cotter and Hanly, 2012; Caporin, 2013; Chang, González-Serrano and Jimenez-Martin, 2013; Power *et al.*, 2013; Yang and Yang, 2013). These kinds of studies concentrated on research into the trading community. In considering risk aversion, hedging activities play an important role in

managing price risks (Conlon, Cotter and Gencay, 2012). Risk-averse supply stakeholders are likely to transfer their price risks to others by hedging. Nevertheless, even some commodity supply stakeholders, who define themselves as risk takers, also hedge some of their commodity portfolios. This depends on what price risks they would like to take, thus, they hedge the remainder. However, hedging functions do not always work properly (Chung-Chu *et al.*, 2012); for example, a price basis between spot and futures markets (Liciotti *et al.*, 2014), or in a range of products in the related commodities (Kim, Brorsen and Yoon, 2014). These problems result in hedging activities becoming a complex task.

Hedging activities are relevant to selecting PRM instruments (Sherafatmand, Yazdani and Moghaddasi, 2014), and the strategy to maximise performance when combined with physical trading activities (Sanda, Olsen and Fleten, 2013). There are theoretical and empirical aspects to hedging with futures contracts, which are summarised by Lien and Tse (2002). On the one hand, from a theoretical view, price hedge strategies are likely to minimise the variance of portfolios by maximising the expected utility function. On the other hand, from an empirical view, the improvement in hedge ratio estimation, to become as optimal as possible in this time-varying context, is one of the most active research areas.

More recent attention has focused on behaviours, ranging from the context of financial investors (Sadi *et al.*, 2011; Yazdipour, 2011) to farmers (Shapiro and Brorsen, 1988; Jordaan and Grové, 2010; Wang *et al.*, 2010; Williams and Malcolm, 2012). Risk-taking decisions made by commodity traders are potentially impacted by several different factors. They can be classified into economic, operational, sociological and psychological factors (Al-Tamimi, 2006; Chang, McAleer and Tansuchat, 2011; Bhattacharya, 2012; Williams and Malcolm, 2012). Economic factors include supply and demand, operational factors include accounting, production and warehouse capacity, sociological factors include customers and suppliers' relationships and social responsibility and psychological factors include previous negative outcomes and loss aversion. These factors could affect decisions in risk-taking in both a positive and negative way.

After reviewing literature related to risk-taking decisions, the next section reviews literature relevant to where to sell commodity products and how to choose a market amongst those available.

2.5 Market Channel Selection

Apart from in agricultural commodity trading, market channel selection has become a central issue for determining trading performance (Yunus and Syahputra, 2013). Since market channels for a particular product may affect overall business performance, choosing the appropriate one amongst those available will determine the extent to which the business is competitive. *"The concept of market selection refers to the process by which several actors decide to sell in different marketing outlets to transact their (agricultural) products"* (Arinloye *et al.*, 2014, p. 2). The purpose of this section is to review the literature on the selection of market channels (more details of commodity market channels can also be seen in Section 2.6.2).

Abdlatif *et al.* (2014) used questionnaires to study dried fish market channels and their structure in Maiduguri Metropolis in Borno State, Nigeria. The research found that both wholesalers and retailers are used as market channels for unprocessed and processed fish. The processed fish market in this research was found to be inefficient, as there is no competition in the market. Consequently, the majority of processed fish is bought at low grade. The research advised that a good infrastructure, good road links and market service equipment is needed for market stakeholders to provide support to the local dried fish market. The research would have been more interesting if factors influencing farmers in their selection of market channels to sell their produce had been included.

In the same vein, Yunus and Syahputra (2013) gave a questionnaire to six hundred research participants, namely rice farmers in the Aceh Province of Indonesia, and interviewed a number of market stakeholders. Their research investigated farmers' market channel selection for selling their produce and market efficiency. The structural equation modelling method was employed to analyse the survey data. The study revealed that the rice market is considered inefficient, as farmers are likely to sell their produce through market channels, which provide low selling performance. This perhaps raises the need for the government to help farmers to improve their farming incomes by choosing better market channels. Moreover, the research points out the close relationship between selected market channels and the selling performance of farmers' produce. Similar to the study by Abdlatif *et al.* (2014), this study would have been more relevant if it had included determinants that farmers use to select market channels.

In their research, Nyaupane and Gillespie (2011) studied determinants used by Louisiana farmers in choosing market channels to sell crawfish. The survey method was employed in the research and conducted in 2008. The results indicated that the

wholesale market and direct markets to end users, retailers and processors are ranked as the most popular. Moreover, the research also found that the size of the farm, income from farms and alternative sources, the age of farmers, their level of education and grading and processing products considerably influence crawfish farmers' choice of market channels to sell their produce.

Jari and Fraser (2012) interestingly revealed that small farmers in the Kat River Valley in South Africa tend to sell their produce through an informal market channel, rather than a formal one. The research employed structured interviews, using a random sampling of one hundred farmers, comprising of citrus, cattle and vegetable farmers. Unsurprisingly, the research found that there are different market channels for different products: all citrus fruits are sold on the export market, vegetables are sold locally and cattle are sold in direct private sales, to speculative traders and at auction markets, slaughterhouses and butcheries. The factors, which are considered as barriers for famers to use formal markets are: the inaccessibility of market information, the unavailability of contract arrangements, the lack of knowledge in grading standards, the lack of decent market facilities and depending on tradition. To deal with such barriers, the research recommended the need for support from market stakeholders, in terms of technical skills and training to survive in a competitive market environment and institutional support in arranging trading contracts.

A number of papers have been published on the factors influencing market channel selection in the context of farmers. Obi *et al.* (2011) pointed out that the inability to access market channels is the main issue for small farmers in South Africa. Moreover, offer prices tend to be a vital factor in selecting market channels (Nyaupane and Gillespie, 2011). However, Jari and Fraser (2012) argued that selling costs are also important. An example of this can be found in the Costa Rican mango market. Zúñiga-Arias and Ruben (2007) indicated that the offer price is considered within the trade-off to management strategy in choosing a market channel to sell mangoes. Another factor which influences the selection of market channels to sell goods is creditability. It is accepted that the default risk of business partners is an important issue in trading (Bielecki and Crépey, 2014). The default takes place when a buyer or seller of a contract does not abide by the terms of the arranged trading contract. Amaya and Alwayng (2011) pointed out that accessibility to relevant information using mobile phones by Bolivian potato farmers also impacts on their decisions in selecting market channels to sell their produce.

It is clear that the majority of agricultural market selection research in this section is conducted in the context of farmers. It is helpful for this research, in terms of guiding agricultural market structure in rural areas, which is similar to that of this research setting to be presented later in this research.

So far, literature related to PRM, including PRM strategies, decisions in risk taking and market channel selection, has been reviewed. In the next section, literature relating to the environment of price risk will be reviewed.

2.6 Price Risk Management Environments

The environment of business tasks is one of the main factors influencing small business management (d'Amboise and Muldowney, 1988). As the task of business focus in this research involves price risk, some particular environmental factors relevant to price risk in commodity markets have been chosen to be investigated. There are particular factors determining price risk in a particular context. Such factors illustrate what level of price risk stakeholders may be exposed to. They are: PRM instruments, market channels, price information, pricing methods used in the industry, price forecasting models, the use of futures markets and the use of technology.

2.6.1 Price Risk Management Instruments

The literature has emphasised the importance of PRM tools, since the availability of PRM tools can be considered as one of the key indicators of the effectiveness of PRM in a particular market. The market that has effective PRM tools available is more likely to be efficient than the market that has not. Moreover, PRM tools are usually related to PRM strategy adoption (Horcher, 2011), as some PRM strategies require a particular PRM tool; for instance, forward selling needs forward or futures contracts to be implemented. In this research, PRM instruments are categorised into five main types: cash market selling, forward, consignment selling, futures and options contracts. These are equivalent to Tomek and Peterson's (2001) marketing groups: cash market selling in the spot-market group, forward selling in the customised trading-contract group, and futures and options contracts in the standardised derivative-contract group.

Some particular types of PRM tool are available in futures exchange markets such as futures, options and swaps contracts (Adams and Gerner, 2012). However, as Sherafatmand, Yazdani and Moghaddasi (2014) point out, some of them, like futures contracts, may not be effective enough for managing price risk of physical commodity

trading. As a result, the performance of PRM tools available to be used in the NR market will be investigated in this research based on RBIs' perspective within the thesis findings.

Some selected PRM tools, namely cash market selling, forward, futures and options contracts, will be discussed in the rest of this section of the literature review. Their advantages and disadvantages are discussed below.

- **Cash market selling**

One of the advantages of using cash markets in selling products is no or low transaction costs. Another benefit of cash markets is that there is no requirement for specific knowledge like that for futures contract use. However, selling in a cash market means a business is exposed to incurring losses from declining prices of commodities in stock holding. As a consequence of using the cash market, traders have to bear the price risk on their own (Blank, Saitone and Sexton, 2014).

- **Forward contracts**

Marquez and Blanchar (2004, p. 39) define a forward contract as*: "a contract to buy or sell at a price that stays fixed for the life of the contract".* The forward contract provides benefits to traders in several ways. It allows traders to deliver physical products as well as manage the price risk (Blank, Saitone and Sexton, 2014). In terms of contract specification, it enables users to customise the contract to meet their specific requirements (Taušer and Čajka, 2014). According to Waldie (2014), farmers can use a forward contract to prevent unfavourable output price movements before crop harvest. Ibrahim and Okeke (2011) add that, apart from output price hedging, farmers can use them for their farm inputs as well. Moreover, Mallory *et al.* (2014) indicate that the forward contracts allow a commodity business to smooth their revenues over the year with comparatively cheap costs.

In spite of the benefits previously mentioned, there is an issue that dissuades commodity traders from using forward contracts (Jordaan and Grové, 2010). One of them, raised by Banterle and Vandone (2013), is that it does not permit hedgers to gain benefits when prices rise. Tauser and Cajka (2014) point out that forward contracts are often considered expensive to use and difficult to change. Blank *et al.* (2014) also highlight that trading prices are usually set by buyers, hence to the relative disadvantage of these small business and sold trader as sellers.

So far, informal PRM tools provided by business partners or market intermediaries have been reviewed. Next are the formal PRM tools arranged by derivative markets.

Derivative contracts, such as futures and options relevant to spot trading, may be used as PRM tools, which may potentially result in gratified hedging results (Chung-Chu *et al.*, 2012).

- **Futures contracts**

"A futures contract is a legally binding agreement to buy or sell a specific quantity of the underlying asset at a predetermined date in the future at a price agreed on today" (Brooks, Rew and Ritson, 2001, p. 17). A futures contract specification, such as contract size, date and place of delivery, is considered more standardised than that of a forward contract (Taušer and Čajka, 2014). Williams (2001) points out that a futures contract enables traders to easily offset their contract positions by buying the opposite contracts; as a consequence, it persuades non-physical traders or speculators to facilitate trading activity in the markets. However, various economists question the role of speculators in either supporting or undermining market trading (Williams, 2001), as discussed in Appendix D.

Although futures contracts provide a method to hedge price risk, a considerable amount of literature has been concerned with the effectiveness of futures markets on price risk hedging (Aggarwal, Jain and Thomas, 2014; Sherafatmand, Yazdani and Moghaddasi, 2014). The hedging effectiveness may be undermined by price basis, trading illiquidity, excessive speculation or even governments' price intervention schemes (Aggarwal, Jain and Thomas, 2014). Yaganti and Kamaiah (2012) highlight the price basis risk, the movement between physical and derivative prices, as a trade-off factor for price hedging. In other words, to eliminate price risk using derivative contracts results in alternative risk, called the basis risk. In their timely research, Revoredo-Giha and Zuppiroli (2013) highlight the occurrence of the basis risk during periods of price volatility. Moreover, like the forward contract, the futures contract does not permit hedgers to gain additional profits from rising prices (Banterle and Vandone, 2013). One another issue in using future contracts in hedging is its costs (Aggarwal, Jain and Thomas, 2014).

There is also an issue of unpopularity of physical product delivery according to futures contracts for some commodities. For example, in the cattle market it is hard to see such a delivery (Blank, Saitone and Sexton, 2014). Other delivery problems include delivery location, warehouse system reliability and commodity specification (Aggarwal, Jain and Thomas, 2014).

- **Options contracts**

Unlike those of forward and futures, options contracts allow users to hedge their price risk as well as enjoy benefits from price movements in their favour (Taušer and Čajka, 2014). *"An options contract is a form of insurance that gives the option purchaser the right, but not the obligation, to buy (sell) a contract at a given price."* (Lane, Richter and Sheblé, 2000, p. 204) To gain an options contract, options users have to pay a premium to the sellers (Taušer and Čajka, 2014).

Apart from the problem of availability of options contracts in the market, users have to pay contract premium costs to obtain the contracts (Taušer and Čajka, 2014). Moreover, the contract price tends to be high during the period of price volatility as the premium price is usually derived from market price movements. Shackleton and Voukelatos (2013) criticise that, in such circumstances, the performance of options hedging weakens when users need it the most. Similar to futures contracts, Blank *et al.* (2014) note that the delivery of physical products according to options contracts has rarely occurred in cattle markets.

2.6.2 Market Channels

In relation to the selection of market channels in Section 2.5, this section clarifies the concept of market channels and their importance. The concept of a market channel is defined by Abdlatif *et al.* (2014, p.147):

> *"Marketing channels are important in evaluating marketing system because they indicate how the various market participants are organized to accomplish the movement of a product from the producer to the final consumers".*

To be more precise, in agricultural commodity supply chains involving small producers, the market is defined as such:

> *"Markets continue to be seen as the means for ensuring that smallholder producers of agricultural products are effectively integrated into the mainstream of national economies, especially in developing countries." (Obi, van Schalkwyk and van Tilburg, 2012, p. 13)*

The different market channels that agricultural commodity supply chain players choose to use tend to result in differences in consumer value (Wang, 2014). Market channels available for selling commodity products can be characterised by the market power of buyers and sellers in the supply chain (Ennew, Ünüsan and Wright, 1993) and the availability of PRM tools (Meulenberg and Pennings, 2002), which in turn leads to the level of price risk that has to be managed, as well as transaction costs (Jari and Fraser,

2012). Closed or direct markets tend to rely on the relationship between buyers and sellers to compensate for the dominant market power of buyers. In contrast, the more open or transparent the market is, the more it is likely to balance the market power between the two.

There are likely to be differences in market structures between different commodity products (Lovreta, Milošević and Stanković, 2013).There are several channels through which supply chain participants sell and deliver commodities. For instance, there are different types of market channels in food supply chains in rural areas, through which farmers can sell their produce, such as farmers' markets, pick-your-own at the farm and direct selling to restaurants or retailers (Welsh, 2009; LeRoux *et al.*, 2010). One particular market channel may be considered to have riskier aspects than others. For instance, farmers are confronted with the higher risk of unsold stock when they sell it via direct markets to consumers than via wholesale markets (LeRoux *et al.*, 2010). In terms of price risk exposure, cash markets for example seem to be more exposed to price risks than forward contracts or futures contracts (Sehgal, Rajput and Dua, 2012; Burdine *et al.*, 2014). On the other hand, forward contracts may face a risk of contract default problem, particularly when market prices are extremely volatile (Mallory, Etienne and Irwin, 2012). However, futures contracts encounter a margin call problem during similar volatile conditions. In this section, the advantages and limitations of marketing channels available to commodity traders are reviewed.

The most fundamental method of trading in commodity markets is in cash markets (Isengildina and Hudson, 2001). This market is mainly a transparent market. Therefore, price transparency in a competitive business environment represents one advantage of this market. However, when considering price management, there is a high level of price risk, as there are limited windows of opportunity regarding price selection.

During a period of increasing integration in commodity supply chains, selling commodity products directly to commodity wholesalers (processors or exporters) is common (Van Tilburg, 2010). Within the nature of private markets, settled prices are usually kept secret to individuals and kept within a group of suppliers. Thus, skill in price negotiation is a key factor for success in these markets. The advantage of these types of market channels is the ability to manage price risks in the longer term, compared with cash markets. However, this kind of contract may lead to default risks during periods of high price volatility.

Desai (2010) pointed out that commodity business intermediaries are necessary where small farmers are producers; this is because operational costs in product processing,

transportation and selling are considered to be high per unit. This also tends to be true for small business intermediaries. Therefore, trading amongst business intermediaries makes it possible to take an advantage of economies of scales, which in turn leads to cheaper operational costs. Furthermore, in the case of trading speculative commodity products, it is not uncommon if one intermediary sells his/her product to others when they receive a satisfactory offer price. On the other hand, business intermediaries tend to be less important in US agricultural supply chains, in which small farmers are producers, since the farmers can earn premium prices by selling their produce within the country (Altieri, 2009). The key difference between such US agricultural markets and Thai NR markets is that the NR market is an export-dependent market. Therefore, the degree to which business intermediaries is important is different in these two markets.

One choice in market channels is to sell commodity products on the futures market and deliver commodity products to the place stated in the contract (Wilson and Miljkovic, 2013). This market channel can manage both physical commodity products and price risks. Market participants gain an advantage from both price transparency and a longer period to choose desirable prices. However, there are some issues that need to be addressed, such as the type, quality and quantity of products, the delivery locations required to meet the specifications of futures contracts or the efficiency of futures exchange markets, especially market liquidity in developing countries (Aggarwal, Jain and Thomas, 2014).

2.6.3 Price Information

Price information can have a twofold influence on commodity trading. Firstly, accessibility to market information allows market participants to gain market power (Croxson and Reade, 2014). Communication technology plays an important role in this aspect, such as mobile phones in Nakasone, Torero and Minten (2014). Secondly, price transmission between markets, especially futures and physical markets, is relevant to market efficiency (Barrett, Carter and Timmer, 2010). The quicker the price is transmitted, the more efficient the market is, and in turn the market becomes more competitive (Arshad and Hameed, 2014).

Price information is one of the key factors, which determines effective trading decisions in the supply chain, as well as providing market power to market participants. For instance, farmers who are able to access price information tend to receive better price offers from business intermediaries (Mitchell, 2011). More transparent and accessible price information leads to a more competitive market as a whole. Consequently, farmers

or producers may gain the most from value chains based on market prices (Mitra *et al.*, 2012), although they may be unable to take on the responsibility for setting prices can therefore put themselves to a position of market advantage. Exporters may lose some market power in trading as a result of farmers' more accessibility to price information. However, they may have an advantage over other domestic supply chain players if they are able to access effective PRM tools, and gain even more of an advantage if they play an active role in price setting in the market. Perhaps, intermediaries are the most vulnerable players to prices risks. They may lose some market power to producers because of the ineffectiveness of the PRM tools available to them, and because these tool are limited to.

Due to low liquidity in the domestic future exchange market, some agricultural commodities are traded in large volumes in foreign futures exchange markets. Consequently, the fluctuation of prices in the foreign markets might influence price movements in a domestic physical market (Boonyanuphong and Sriboonchitta, 2014). Singh *et al.* (2015) pointed out that the level of market efficiency can be assessed by measuring the level of price transmission between markets. Sapkota *et al.* (2015) added that not only is the level of transmission important, but its direction is as well. It can be used to study the role of price formation from players within the supply chain.

2.6.4 Pricing Methods

Pricing methods play a vital role in business, as pricing methods can be used to gain competitiveness in the market, and they are commonly used to attract and retain customers (Kumar, 2014). Pricing methods in trading also determine the balance of market power between buyers and sellers. Regarding any general trading activity, they can be categorised into buying and selling pricing methods. There is evidence of multi-pricing methods used by beef packers in the United States, whereby buying and selling pricing methods are irrelevant (Fausti *et al.*, 2014). Therefore, it is a challenging task to maintain trading profit margins.

Pricing is a necessary and vital activity in commodity trading. Trading in commodities means that when one supply player buys and sells products, many others are doing the same thing. Therefore, pricing is considered key to how competitive and profitable the business is. Liciotti *et al.* (2014, p. 148) defined pricing by retailers as *"…the activity of establishing the best price that is competitive for shoppers and at the same time with a good profit margin for the store."* For example, buying commodity products too cheaply may discourage suppliers from selling, or because of decreasing market prices, selling at

a lower price than the purchase price means the business may go bankrupt. Pricing is a challenging decision, even in the most active markets, such as the financial markets (Zhang, Yang and Zheng, 2010), but also food markets (Azad *et al.*, 2013) and industrial goods (Yazdani *et al.*, 2013). It is far more difficult in the upstream commodity supply chain when the market becomes volatile, because supply chain players, such as commodity business intermediaries and small famers, are incapable to use effective PRM tools and have little resource to deal with it (Newman, 2009).

A pricing method in trading determines the extent of the profit margin in the business, as well as market power. A high profit margin means more buffers to absorb adverse market price movements for business intermediaries. However, for farmers in developing countries, this may unfortunately result in poverty, as they receive a lesser proportion in value chains (Mitra *et al.*, 2012). A salient example of this is found in the coffee supply chain, where coffee business intermediaries (wholesalers) enjoy high profit margins (Gachena, 2014). On the other hand, a business with a small profit margin is likely to have a higher impact on price movements, relative to one with a larger profit margin. A well-known example of this is the blade-razor profit margin in the milk industry (Jayaweera *et al.*, 2007). It becomes even more complex when the input (feed) and output (milk) prices are volatile (Wolf and Widmar, 2014).

2.6.5 Price Forecasting Methods

The forecasting of price movements is a key element for commodity traders in order to make informed decisions (Daneshi and Daneshi, 2008; Mandal *et al.*, 2010; Kutbatsky *et al.*, 2011; Shayeghi and Ghasemi, 2013). In particular, commodity trading is based on price speculation. Therefore, the performance of forecasting methods is a positive indicator of enhanced explanation of business performance. However, the performance of available forecasting methods is questionable (Zareipour *et al.*, 2011). The main reason for this is mainly due to the nature of price movements, which are both complex and dynamic. Scher and Koomey (2011, p. 473) noted that:

> *"Structural constancy, both across time and across variable conditions, is a necessary precondition for accurate forecasting. Physical systems exhibit structural constancy, but economic and social systems generally do not."*

Despite the accuracy issue in forecasting commodity prices, there are a number of published studies that describe its role in PRM practices. Vahidinasab, Jadid and Kazemi (2008) highlighted the need for short-term price forecasts to make profits, by creating PRM strategies in electricity markets. Similarly, Zhao *et al.* (2007) pointed out that the

performance of commodity supply chain players in PRM can be improved by price forecasting methods. This is perhaps because PRM strategies are commonly adopted based on decision makers' perceptions of futures price movements (Angelus, 2001). In the same vein, Dooley and Lenihan (2005) argued that since there is no forecasting method that can predict future prices accurately, PRM strategies are required to be used in tandem with any available forecasting method. Rather than focusing on forecasting accuracy, Lin, Gow and Tsai (2010) pointed out that traders need a forecasting method that is possible to be used in practice. Thus, price forecasting is considered important in commodity trading, even though it may be ineffective.

2.6.6 Futures Market Use

The commodity futures market is widely understood to be established for the purpose of supporting the physical trading activities of commodities, mainly in price formation, as a PRM tool, as a benchmark price for physical trading, price forecasting, price speculation and as a trading market channel (Ghosh, 2013; Revoredo-Giha and Zuppiroli, 2013; Welch *et al.*, 2013). However, not every market is able to provide all the required functions. As a result, it may elucidate the extent of the price risks that market players are exposed to in a commodity market.

One of the main purposes for establishing a futures market is for hedging a price risk to reduce losses as a result of unfavourable price movements (Yaganti and Kamaiah, 2012; Haq and Rao, 2013). This function helps smooth the physical trading in commodities, regardless of price fluctuation. Commercial traders, such as commodity processors, are amongst those who need to hedge the price risk and use futures markets as one of their alternatives (Revoredo-Giha and Zuppiroli, 2013). The price hedging function in a futures market not only contributes to the direct commodity product listed in the market, but other products, which have similar price movement patterns, are able to gain benefit from the function.

There are different kinds of futures market participants. The commodity supply chain players are considered as hedgers when they hold physical products (Newman, 2009). On the other hand, participants in futures markets who are not involved in physical trading are classified as speculators. However, physical traders can change their roles in futures markets to speculators when they hold futures' positions, and without holding physical commodities, purely because of price expectation.

Not only do the direct participants in futures markets benefit, but other stakeholders in the whole commodity supply chain can use prices in futures markets as reference prices

or price risk exposure indicators in trading activities (Sehgal, Rajput and Deisting, 2013). The main indirect consequence of futures markets for society as a whole is price formation (Kumar Soni, 2014). Upstream supply chain stakeholders, who rarely directly participate in futures markets, use prices in futures markets as reference prices, and occasionally as price predictors (Zheng *et al.*, 2012). Such functions play a crucial role in their daily trading decisions. However, using a futures' price as a reference price or hedging in commodity trading is sometimes difficult, particularly during periods of high price fluctuation, as a result of a price asymmetry transmission (Rajcaniova and Pokrivcak, 2013) or a basis risk (Power *et al.*, 2013), respectively.

2.6.7 Technology Use

In developing countries, it is clearly seen that ICTs play an important role in the development of both urban and rural areas and their success depends on their accessibility and efficiency in using them (Walsham and Sahay, 2006; Touray, Salminen and Mursu, 2013). A salient example of using ICTs from the perspective of a developing economy in an urban area is the urban transport management of Cameroon (Njoh, 2012), whereas in the rural area, it is the use of mobile phones for a financial service in Kenya (Foster and Heeks, 2013). As this research was conducted in Thailand's NR industry, which is located in the rural area, the following literature that was reviewed was in relation to ICTs and the agricultural business in the rural economy in such developing countries.

ICTs are likely to be considered as an instrument to encourage the efficient facilitation of information flows in emerging markets (Aleke, Ojiako and Wainwright, 2011a). They play a crucial role in price information transmission in commodity markets, as well as supportive trading activities, such as accounting and as a tool for analysing data. Regarding commodity having become financialised in recent years, communication technology is part of this phenomenon, as a tool for price transmission horizontally between markets (Nissanke, 2012) and vertically, along supply chains (Aker, 2011). For example, farmers in rural areas gain more access to price information using mobile phones and, consequently, enhance their negotiating power at the bottom of the supply chain from global market price movements. As a result, every stakeholder in commodity markets, regardless of the availability of their knowledge and resources of PRM, may be exposed to the same level of price risk.

With respect to agriculture, ICTs are able to influence business in various aspects; for example, transaction cost reduction (Saravanan, 2012), information gaining and

exchanging (Aleke, Ojiako and Wainwright, 2011b; Otter and Theuvsen, 2013), financial service access (Goyal and González-Velosa, 2013), forecasting (Latifeh and Zahra, 2009) and decision support systems (Singh, Sankhwar and Pandey, 2014). One particular type of ICT widely used in developing countries is mobile phones (Otter and Theuvsen, 2013). Furthermore, it is evident that one of the vital factors influencing SMEs in agricultural sectors in developing countries in terms of making them operate productively and effectively is the success of ICT adoption (Aleke, Ojiako and Wainwright, 2011a). However, Goyal and González-Velosa (2013) pointed out that although ICTs have a number of potential benefits for agricultural business, many agricultural markets have not fully reached the optimum point of its utility yet.

In this section, the seven aspects of price risk environments mentioned above have been explained. The section that follows moves on to considering the conceptual framework of this research and commodity PRM practice, which has emerged from previous literature reviews.

2.7 Research Conceptual Framework

In this section, a conceptual framework of commodity PRM practices emerged from the review of literatures in Appendix D in relation to a price risk phenomenon and the previous Sections: 2.3, 2.4, 2.5 and 2.6, in relation to PRM and price risk environments and is introduced based on the research aims presented in Chapter One of this thesis. As seen in Figure 2.1, the framework comprises of four main components: PRM strategies, risk-taking decisions, market channel selection and price risk environments. According to the strategic management process, management strategy consists of two main stages: strategy formation and implementation. As a result, PRM practice in the conceptual framework is divided into PRM strategy (formation) and operation (implementation). PRM operation is further classified into decision-making in risk-taking and market channel selection, as they are the main activities in commodities trading. Moreover, the price risk environment components, comprising of PRM tools, market channels, price information, used pricing and price forecasting methods, and the use of futures markets and ICTs, provides insight into the degree of price risk in the market and the capability to manage it. The proposed conceptual framework will be utilised in further stages of this research, particularly in the next chapter on research design, as well as supporting the analysis and findings that are integral to this study.

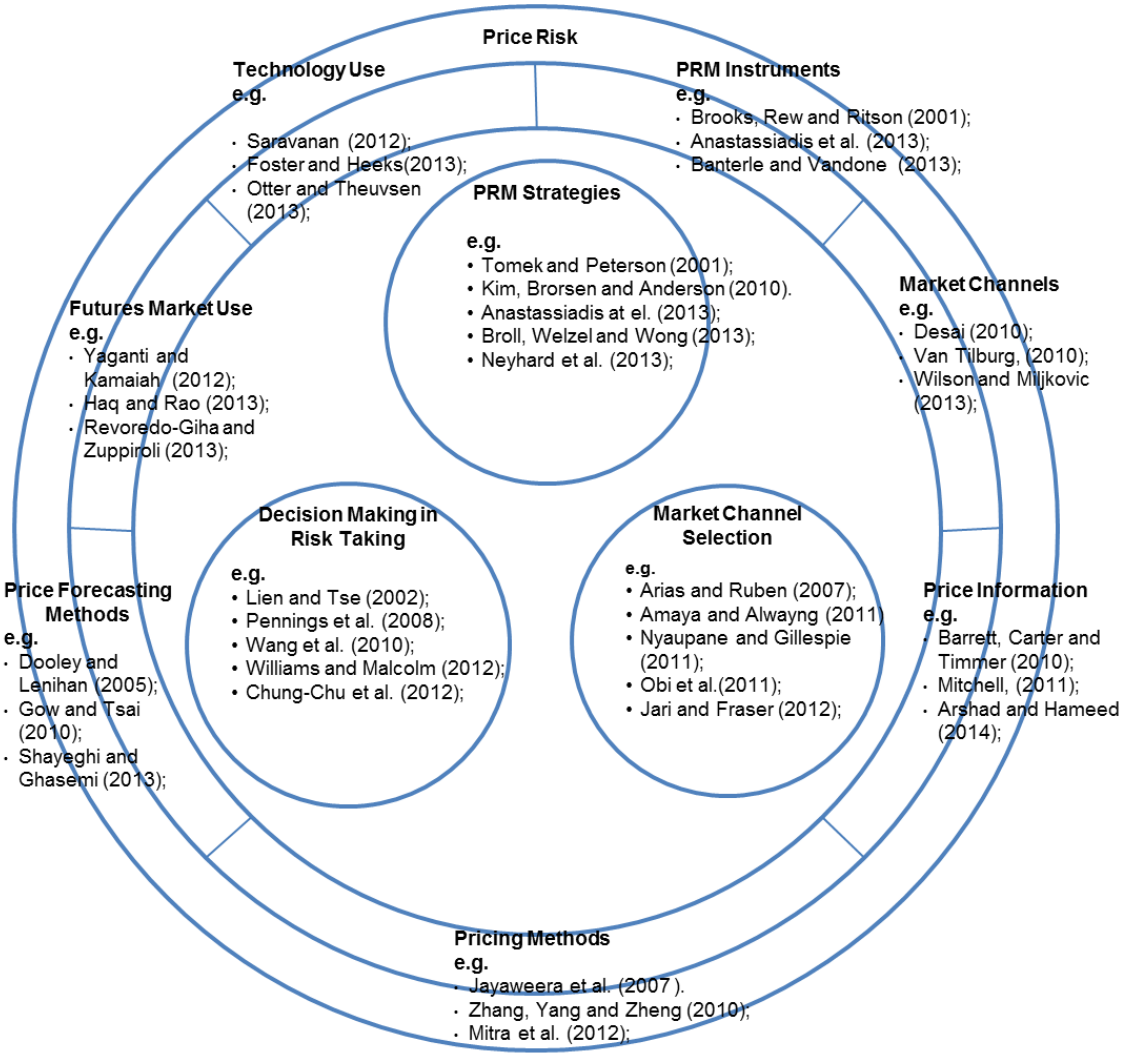


Figure 2.1: Conceptual framework for PRM research emerged from literature

The conceptual framework was formed by synthesising the concepts emerging from existing literature relating to price risk and PRM. The literature used to form the conceptual framework is from a variety of study fields, considering different types of commodities, structure and location of markets, as well as diverse market stakeholders. Therefore, the derived conceptual framework offers clear links amongst the research's relevant concepts. As the research to be presented is of a primary nature, it is a helpful tool in guiding the research design, particularly in outlining interviews in research fieldwork and other associated stages, namely data analysis and the conclusions that emanate from this research.

The following section moves onto considering PRM practices from different players in commodity supply chains, namely financial investors, commercial traders and farmers.

2.8 Research in Price Risk Management

There are a number of stakeholders involved in commodities trading; ranging from supply chain players who directly participate to physical markets, such as producers, intermediaries, processors, exporters and users, to commodity derivative market participants, such as speculators and hedge funds. They are all involved in price risk, transmitted along supply chains (Newman, 2009). Recently, a large and growing body of literature has investigated the practice of PRM. The following includes some selected literature relevant to price-risk management practices from financial investors, commercial traders and farmers.

2.8.1 Financial Investors' Price Risk Management

In recent years, there has been an increasing amount of literature on PRM in commodities trading, and perhaps the majority of research into PRM or trading strategies in commodities markets has been in the financial sector, such as speculators and hedge funds. As was mentioned in Appendix D, there has been an increase in the number of financial traders participating in commodities markets. The phenomenon is known as the financialisation of the commodity exchange market (Newman, 2009; Heumesser and Staritz, 2013). As a result, a considerable amount of literature has been produced around the theme of proposing new or innovative normative models (Lim and Cheng, 2012; Chordia *et al.*, 2013; Narayan, Narayan and Sharma, 2013), alongside an assessment of the particular models, trading techniques or strategies, (Szakmary, Shen and Sharma, 2010; Daskalaki and Skiadopoulos, 2011; Masteika and Rutkauskas, 2012), with a particular focus on traders.

Research into price analysis, in order to understand price behaviours is evident in the literature, such as stochastic price behaviour analysis (Mohan *et al.*, 2014), spot and futures price co-integration (Inoue and Hamori, 2014) and price transmission analysis (Assefa, Meuwissen and Oude Lansink, 2014). Normative models, proposing trading systems to optimise trading profits also figure heavily in literature, with covering technical trading rules (Chang, Chan and Chiang, 2014), transaction cost minimisation (Horst and Naujokat, 2014), trading monitoring systems (Aivaliotis and Palczewski, 2014), arbitrage opportunity searching systems (Liu and Liu, 2014), hedging ratios (Yun and Jae Kim, 2010) and innovative trading strategies (Erlwein and Müller, 2014). Behavioural finance or trading practices by investors in particular have also started grabbing the attention of researchers (Muradoglu *et al.*, 2012; Suresh, 2013; Statman, 2014).

2.8.2 Commercial Traders' Price Risk Management

Unlike financial investors, who are only involved in trading activities in financial markets, commercial traders: commodity processors, exporters and users, participate in both financial and physical markets. To be clear, commercial traders tend to concentrate on physical trading as well as use financial tools to facilitate their physical trading activities (Newman, 2009; Kouvelis, Li and Ding, 2013). Commercial traders, such as commodity processors for example, play a crucial role in adding value to raw material and selling it on in the form of other products. Therefore, their business is involved in both input and output price movements. Consequently, the main challenge faced by commodity processors is PRM. Much of the current literature on PRM practices, in the context of commercial traders, pays particular attention to the integration of PRM strategies in production management.

In terms of PRM tools, commercial traders are more likely to have better access to these than farmers, because of their resources and knowledge. Therefore, recently more attention has focused on the provision of tools or techniques to gain a competitive edge in business. For example, Boyarskaya *et al.* (2014) proposed a decision support system for chocolate manufacturing companies. The system is based on a dynamic approach, dealing with both the PRM of cocoa and the size of production, while taking into account the complex decisions needed to be made during periods of economic instability. Using a simulation, rather than a traditional qualitative approach, this allows decision makers to understand the situation better, in terms of providing an optimal yearly plan.

However, in contrast to financial investors, the majority of literature on commercial traders emphasises the importance of hedging rather speculation (as with financial investors). A possible explanation for this might be that commercial traders use financial tools to support physical trading, which is the core of their business (Kouvelis, Li and Ding, 2013).

2.8.3 Farmers' Price Risk Management

There is a very recognisable body of literature has been published on PRM practices in farming. Instead of emphasising the development or testing of new trading techniques, in this context much of the current literature on PRM pays particular attention to the availability and the efficiency of PRM tools, market structures, the accessibility to price information and the use of futures markets or ICTs. Farmers, as agricultural commodity producers, are perhaps the most vulnerable participants exposed to price risk in the

supply chain, as they are the first players in the commodity supply chain. Therefore, their ability to manage price risk is considered one of the success factors of their business. Farmers may be divided into large or small players, according to the size of their business. However, they are all faced with similar price risk if they participate in the same market. As a result, they need similar skills in order to cope with price risk. Heumesser and Staritz (2013) highlighted this in the context of commodity traders. Small traders tend to have an inferior trading performance relative to bigger traders, because of their available resources and trading abilities.

According to Tomek and Peterson (2001), farmers' PRM practices are considered complex. As a consequence:

> *"Numerous models of optimal marketing portfolios for farmers have been specified, but their behavior appears to be inconsistent with most, if not all, of these models." (Tomek and Peterson, 2001, p. 953)*

Factors found to influence farmers' PRM practices have been explored in several studies. Pennings *et al.* (2008) explored the influencing factors on market channels and PRM instruments embraced by farmers. Despite identified factors, Franken, Pennings and Garcia (2012) highlighted the lack of understanding of the details of using such PRM instruments, in terms of their used ratio.

So far, this chapter has focused on PRM practices from the perspectives of financial investors, commercial traders and farmers. The following section will discuss and demonstrate the lack of research from the perspective of RBIs.

2.8.4 The Lack of Research in RBIs' Price Risk Management Practices

Business intermediaries play a crucial role in connecting commodity producers and consumers by the activities of delivering and stocking commodities in order to obtain a profit (Oguoma, Nkwocha and Ibeawuchi, 2010). Russell (1987) noted that such intermediaries are essential for agricultural products which are dispersed geographically and produce their chosen commodities in small amounts. Hansen also argued that *"…networks of middlemen were key to the success of the rural regions"* (2012, p. 59) and critiqued that there is a lack of understanding of the grain business activities based on the perspective of the business intermediaries in the Indian grain market, although they play such an important role.

There is a range of different business intermediaries in supply chains, such as dealers, distributers (Olsson, Gadde and Hulthén, 2013), retailers (Lahiri, 2012), importers (Madsen, Moen and Hammervold, 2012) and exporters (Lambsdorff, 2013). The research presented in this thesis focuses on the business intermediaries who play a role in buying NR products from NR farmers, auction markets or other intermediaries, and reselling them to processors, auction markets or other intermediaries, thereby building on the potential gaps as shortcomings in the research to date highlighted here.

It is argued that the role that business intermediaries play in the supply chain may result in supply chain efficiency (Wohlgenant, 2014). In other words, the intermediaries may make the supply chain they participate in more competitive by reducing transaction costs for the whole supply chain as a consequence of the functions they provide. Such functions include product sourcing and distributing (Oladi and Gilbert, 2012), market searching and bargaining (Wright and Wong, 2014), finance providing (Russell, 1987), price speculating (Bayer, Geissler and Roberts, 2012), supply balancing (Watanabe, 2010), product branding (Bardhan, Mookherjee and Tsumagari, 2013), lead-time reducing (Masters, 2007) and information exchanging (Hassler and Franz, 2013). Moreover, the provided functions can be arranged in either formal or informal ways (Pedroza, 2013). Although business intermediaries in commodity supply chains are often critiqued that they tend to exploit farmers and/or consumers to generate profits (Dow, 1973; Hayami, Kawagoe and Morooka, 1988), the competition in the market inhibits the business intermediaries from doing so (Plott and Uhl, 1981). Hayami, Kikuchi and Marciano (1999) also found that the competition from the number of business intermediaries in the rice market increase farmers' welfare. Despite these examples, Crona *et al.* (2010) pointed out that there is little research into the role of business intermediaries, in their case with reference to the (fish) supply chain in coastal communities of Kenya and Zanzibar. With this in mind, the work presented here will build on the limited research available and fill knowledge gap through its assessment of the business intermediary role.

A business intermediary is flexible in taking a market position; therefore, he/she has to rely on risk management skills (Williams, 2014). Anyone in this role who lacks of such skills may not be able to survive in the market. Muchfirodin, Guritno and Yuliando (2015) found that one of the most important risks that tobacco business intermediaries want to avoid are those related to price. However, they did not describe how the intermediaries manage risk in practice. Newman (2009) convincingly indicated that there have been increases in price risk exposure on the part of supply chain players in the coffee sector

as a result of the financial sector participating in global futures markets. She also pointed to the inequality in terms of accessibility to PRM tools amongst the supply players.

It is perhaps undeniable that the risks associated with price movements have been the core concern in the agricultural business for a long period of time (Broll, Welzel and Wong, 2013; Bocquého, Jacquet and Reynaud, 2014). It has become an even more critical issue for those located in rural markets and is combined with increasing commodity price volatility in recent years as a result of more financial investors participating in the global futures markets (Newman, 2009). As Williams (2012) suggested, business intermediaries are considered to be price-risk carriers in the commodity supply chain and they need to manage these specific risks in order to survive. Therefore, to build on the existing but somewhat limited research into the PRM in the context of RBIs, this research is seeks to understand the PRM practices of the RBIs in the south of Thailand, which is the main NR producing area of Thailand, and in the world beyond these national borders

Although there is literature relevant to the PRM, they are dominated by those financial sectors where the markets are better established, and ready for the implementation of advanced, innovative management strategies related to evolved market environments (as in Section 2.7.1). Regarding the PRM practices of commodity supply chain players, there exists research relevant to players including users, exporters/processors and farmers. However, the majority of research has been conducted in a developed country context. To extend this research into PRM practices of the intermediaries' role in supply chains, especially in developing countries, where producers are mainly smallholders, the research here will build on these existing studies and provide a unique contribution to knowledge.

2.9 Chapter Summary

This chapter presents a literature review guided by the research objectives (as presented in Section 1.4). Rather than studying an individual issue of PRM, this research has devised a unique, integral conceptual framework for investigating PRM practices and price environments based on the existing literature. The review, including Appendix D and this chapter, provides the conceptual framework for this research, as presented in Figure 2.1 in this chapter. The derived framework will be later utilised to construct the main tool used in the fieldwork (e.g. the interview guide).

The conceptual framework is divided into three layers. The outer layer derived from the literature review in Appendix D represents the phenomenon of price risk in commodity

markets, which in turn has led to the emergence of this research. In the middle layer, the conceptual framework also includes price risk environments in a trading context in terms of seven factors: the availability of PRM tools, market channels, price information, the use of pricing methods, price forecasting methods, futures markets and technology (see Section 2.6). These seven perspectives will be used to explore the research setting to help understand the complexities of price risk environments where RBIs operate their business through the use of fieldwork in the later stage of this research. In the inner layer of the conceptual framework, the main focus of this research, the review comprises the literature in relation to PRM. According to the literature, PRM activities can be classified in terms of three main aspects: strategies in commodity trading (see Section 2.3), decisions in risk taking (see Section 2.4) and market channel selection (see Section 2.5).

Finally, PRM practices in the context of various supply chain players such as farmers, commercial processors and financial traders are reviewed (see Section 2.8). Regarding the literature in relation to PRM practices, there is a current lack of PRM in the context of RBIs, which is the topic of this research and one which needs to be investigated. In conclusion, this research provides an assessment in the context of a developing economy, and therefore provides a specific contribution to knowledge.

The rationale for, and judgement, with regard to the research methodology and methods used in this research is laid out in the following chapter.

Chapter 3 Research Methodology and Methods

3.1 Introduction

This chapter presents the research methodology and the methods used to investigate PRM practices in the context of RBIs, after the gap in knowledge was identified and presented in the preceding literature review chapter. The rationales for the methodologies are provided in each particular stage of the research. Section 3.2 outlines the research question and the chosen research paradigm and its epistemology and ontology are provided in Section 3.3. Section 3.4 explains the combined approach to the research, which uses both qualitative methods and the case study as tools. Sections 3.5 and 3.6 provide information concerning the research participants and their recruitment, as well as what data was collected and how. The method of data analysis, template analysis, and the use of NVivo software is detailed in Section 3.7. In order to raise the quality of this research, several issues were assessed to ensure its reliability; such methods are discussed in Section 3.8. Regarding the comprehensive consideration of ethical issues in research, Section 3.9 outlines the processes of the research in order to confirm that this research has been conducted according to University regulations. The final section, 3.10, provides a summary to this chapter.

3.2 Research Question

From a review of literature on price risk in Appendix D, it is clear that the phenomenon of commodity price volatility has attracted a great deal of attention from stakeholders in commodity communities, ranging from policymakers to researchers and to commodity supply chain players. From the literature, there are several determinants that drive commodity prices to become volatile, such as supply-demand imbalance and speculation. Furthermore, the consequences of commodity price fluctuations impacting on participants in the supply chain represent a crucial social and economic issue. There are questions of the extent to which the implications of commodity price volatility affects supply chain participants and the actions they take in responses. In this context, the commodity is NR products and the supply participants are RBIs.

NR is an agricultural commodity and there is a high level of variety in market participants, from less advanced markets in the upstream supply chain to advanced industries in the downstream supply chain, such as tyre and medical glove industries (Soontaranurak and Dawson, 2015). An RBI is one of the upstream players in this chain. They provide the service to farmers by buying NR products and by selling and transporting the products to

processors or exporters. The role they play is highly sensitive to price changes as their profits lie in the difference between the cost of buying and the revenue from sales of the product they have bought. Generally, both buying and selling prices mainly depend on rubber market prices.

This research aims to investigate the complexity of this phenomenon in the form of the following research question:

> *"How do rubber business intermediaries manage natural rubber price risks, taking into account the volatility of prices in Thailand?"*

In order to answer the research question, there are five sub-questions to be addressed, as outlined in Table 3.1. The research question mapping in Table 3.1 also illustrates the sources of the literature that leads to the identified research questions.

3.3 Research Paradigm

The research philosophy that the researcher adopts plays an important role in research design as the research philosophy includes a researcher's assumptions that become a part of the research strategy, such as research data collection. This research adopts the interpretivist paradigm. This research is founded on the phenomenon of NR price fluctuations, which is an issue the NR industry is currently grappling with. An explanation of how rubber supply players behave—in this case, the supply intermediaries—in reaction to this phenomenon, is provided below.

According to Guba and Lincoln (1994), a paradigm is a world view or a belief system that guides a researcher in their work. From all available paradigms, positivism and interpretivism tend to have the most influence (Gray, 2009). The aim of positivist research, which is mostly used as a scientific method, is *"to find all the regular laws or patterns in our universe"* (Oates, 2006, p. 284). For example, Newton's law of gravity outlines the fact that objects always drop to the floor. The researcher is objective in his/her relationship with the subject of the study (Oates, 2006), therefore, the study can be investigated using observations (Gray, 2009). Contrary to this method, interpretive studies want to capture *"the social meaning of social action"* (Bryman, 2008, p. 16). Such studies involve individuals' subjective perspectives, with the researcher influencing the study.

Table 3.1: Research question mapping

Research Questions	Underpinning Literatures
Q.1 What are the characteristics of rubber intermediary business and its role in NR supply chains?	Delarue (2011); Williams (2012); Weerathamrongsak and Wongsurawat (2013)
Q.2 What are the characteristics of price risk in the NR market and how does it impact on rubber intermediary business?	Gilbert (2008); Masters and White (2008); Mayer (2009); Newman (2009); Silvennoinen and Thorp (2009); Tang and Xiong, (2010); Bicchetti and Maystre (2012)
Q.3 What are the PRM practices of RBIs in terms of PRM strategies, their decisions in risk taking and market channels?	Tomek and Peterson (2001); Pennings et al. (2008); Newman (2009); Chung-Chu et al. (2012); Franken, Pennings, and Garcia (2012); Williams and Malcolm (2012); Broll, Welzel and Wong (2013); Neyhard et al. (2013)
Q.4 What are the factors influencing RBIs' PRM practices and how do they influence the practices regarding PRM strategy formation, risk-taking decisions and market channel selection?	Newman (2009); Nyaupane and Gillespie (2011); Chung-Chu et al. (2012); Franken, Pennings, and Garcia (2012); Williams and Malcolm (2012); Haq and Rao (2013)
Q.5 What are the price risk environments of RBIs in terms of PRM instruments, market channels, price information, pricing methods used in the industry, price forecasting models, the use of futures markets and the use of technology?	Harri, Anderson and Riley (2010); Jordaan and Grové (2010); Getnet et al. (2011); Ibrahim and Okeke (2011); Abbey and Doukas (2012); Mittal and Mehar (2012); Yaganti and Kamaiah (2012); Nakasone (2013); Yunus and Syahputra (2013);

This research adopts an interpretivist paradigm to guide this study about PRM from the perspective of RBIs. The interpretivist paradigm is usually concerned with *"subjective and shared meanings"*, focusing on *"how people…interpret and understand social events"* (Eriksson and Kovalainen, 2008, p. 19). In order to study a social event, researchers accept that *"social reality is an ongoing accomplishment of social actors rather than something external to them and that totally constrains them"* (Bryman, 2008, p. 20). Some researchers explain the nature of reality as ontology, as interpretivism is rooted in a position of relativism, incorporating the idea that *"There are multiple truths"* (Easterby-Smith, Jackson and Thorpe, 2012, p. 19) and *that "'The 'reality' is determined by people rather than by objective and external factors"* (Easterby-Smith, Jackson and Thorpe, 2012, p. 23). From this view, an individual's experience with different aspects of studies is subjective and leads to these varied and multiple meanings (Creswell, 2008, p. 8).

The epistemological position of this research is based on, constructionism, knowledge construction from intermediaries' views on PRM (see in Figure 3.1). The construction of knowledge in terms of PRM is based on multiple perspectives from individual intermediaries. Crotty (1998) states that *"meanings are constructed by human beings as they engage with the world they are interpreting"*. Oates (2006) further explains that the meanings and understanding of reality can be accessed or transmitted only by the construction of knowledge through languages and shared meanings and understanding. Such meanings and understanding may be different between groups of people across time (Oates, 2006). The findings of this research are mainly influenced by intermediaries' perspectives on PRM, the researcher and any relevant theories the researcher has encountered. Social scientists who adopt an interpretative standpoint not only interpret meanings from people's views but, in addition, their own interpretations and understanding of existing theory relevant to the topic influences their findings (Bryman, 2008).

It is important to note that, at the early stage of this research, the researcher focused mainly on NR price mechanisms as a research topic. The research aims were to identify suitable linear and non-linear forecasting models of NR prices and to compare the effectiveness of these models, in order to develop a decision support system to help RBIs manage their rubber trading. However, although the researcher spent more than a year collecting secondary (price time series) data from various sources and modelling the data, it became clear that the research topic was a more complex and dynamic issue than the researcher had assumed at the beginning of the research. Moreover, the former research topic may well be unhelpful to RBIs as their businesses have relatively low

margins for comparing the level of a possible forecasting accuracy on a daily basis, which is consistent which their trading behaviour. The researcher later gained more understanding about an alternative paradigm (the interpretivist approach) and its ability to deal with a complex issue in terms of understanding, which may be more appropriate and meaningful to this research as the current research topic also lacks in-depth, qualitative research of PRM in the context of RBIs. The researcher finally decided to shift the research paradigm adoption from postivism to interpretivism in order to conduct this research (as illustrated in Figure 3.1). Moreover, in terms of the main aim of this research which is to understand the complexity of PRM practices of RBIs, this research desires to address the need to build an understanding of the in-depth data that will be collected as a result of the fieldwork. In doing so, a conceptual framework (see Figure 2.1) derived from a review of the existing literature will be utilised in order to develop a conceptual model based on an assessment of the primary data. The model so derived will be established and assessed in the context. Hence, this research adopted the interpretivism rather than the postivism.

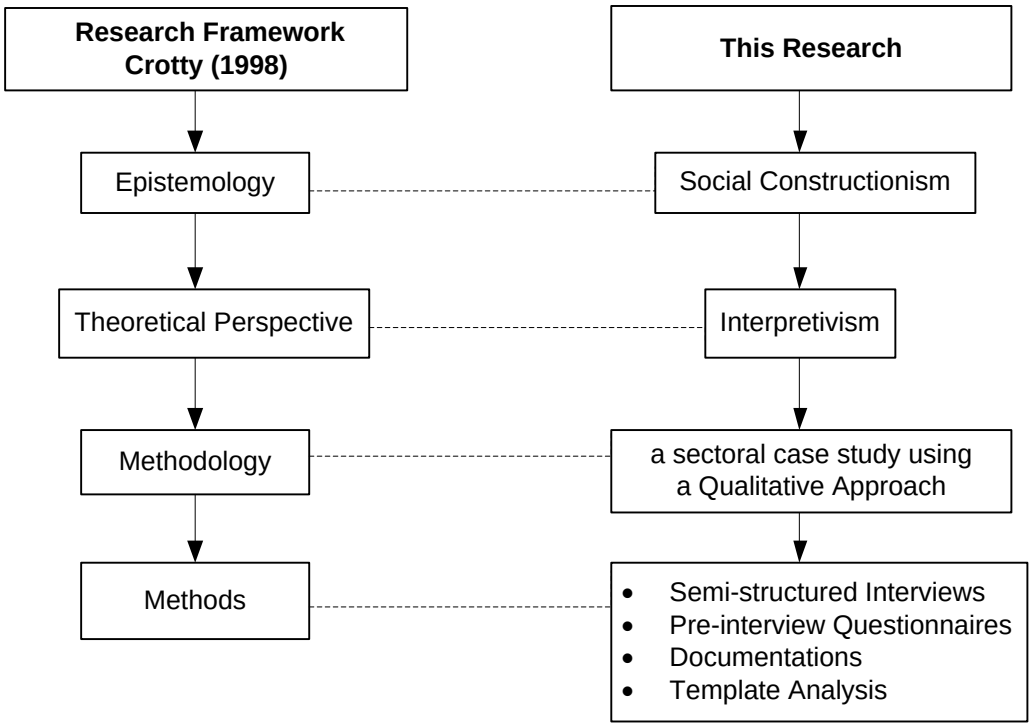


Figure 3.1: Research framework adapted from Crotty (1998)

3.4 Research Strategy and Research Design

As stated above, research paradigms can be used as a research guide, which, in turn, leads to particular research strategies and methods in research design. It is common in a case study to use a qualitative data collection method as such qualitative methods are considered supportive in generating rich data to illustrate the case (Bryman and Bell, 2011).

3.4.1 Qualitative Research

Qualitative, quantitative or mixed approaches have different characteristics, which is helpful for identifying a particular research design. Creswell (2008) suggests that conducting a qualitative, quantitative or mixed approach encompasses the strategies of enquiry and the procedures of research design. Researchers may employ quantitative strategies; for example, surveys and experiments. In qualitative research, research strategies such as grounded theory and case studies are types of approaches. Quantitative studies tend to quantify things in terms of numbers in order to develop a model. They may employ statistical methods with a large group of participants; however, a small group of people and a detailed description of a social phenomenon are used in qualitative approaches.

The quantitative approach is usually based in positivist research whilst qualitative research tends to adopt interpretivist paradigms (though they are not always true). This is because a relationship between theory and research requires a deductive or an inductive approach (Bryman, 2008). A focus of experiments in the deductive approach is to test theories and the existing literature informs a hypothesis for the research at the early stage of the study. In the case of the experiment characteristic of the deductive approach, researchers use *"quantitative data and mathematical techniques to measure inputs and outputs and the relationships between them"* (Oates, 2006, p. 299). On the other hand, interpretivist studies begin their research with a research problem and try to generate a theory from the data. Qualitative research sees the world from the participants' point of view because people can contribute meaning to their environments that natural objects such as atoms cannot (Bryman, 2008).

"When the predominant research strategy is qualitative, a case study tends to take an inductive approach to the relationship between theory and research; if a predominantly quantitative strategy is taken, it tends to be deductive" (Bryman and Bell, 2011, p. 60). In this research, a qualitative approach with a case study design was chosen and deemed

suitable for the aim of understanding PRM in the practices of RBIs. This study aims to explore and explain a complex phenomenon of PRM from the intermediaries' point of view. As a result, an in-depth description of PRM strategies in their context is provided.

According to Crotty (1998, p. 14), *"the distinction between qualitative research and quantitative research and quantitative research occurs at the level of methods."* This view is supported by Bryman and Bell (2011) who write that *"qualitative research can be construed as a research strategy that emphasizes words rather than quantification in the collection and analysis of data"* (p. 27). Due to its methods of data collection, this research can be classed as a qualitative study. As a consequence, such rich data was analysed in the later stages of the study in order to address the research question.

3.4.2 Case Study

As stated above, positivist and interpretivist paradigms influence approaches and strategies used for conducting research. Oates (2006) points out that *"case studies are often associated with the interpretative paradigm"* although sometimes case studies can be based on the positivist paradigm. She further emphasises that research aims can help to identify an underlying paradigm. One study may aim to *"provide an account of what occurs in a social setting"* (Oates, 2006, p. 300) whilst another study may wish to *"confirm or refute theories"* (Oates, 2006, p. 301).

This research adopted the case study research strategy (see Figure 3.1), given that Yin (2009, p. 18) defines a case study as:

> *"an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context...".*

PRM practices are derived from the interactions amongst PRM strategies, decision making in risk taking, market channel selection and price risk environments. As a consequence, the issue of this study could be considered to be complex. As this research aims to enhance the understanding of a complex issue mentioned above, this is consistent with the fact that the case study, *"which is informed by a constructionist epistemology, is much less concerned with issues of validity, and more concerned with providing a rich picture of life and behaviour in organizations or groups"* (Easterby-Smith, Jackson and Thorpe, 2012, p. 55). Moreover, the type of research question explored by this study is the *'how'* question. Answering this question, Yin (2009) states, is aided by utilising the case study. Therefore, a case study is an appropriate tool to study this research question.

According to Stake (2008), one type of case study is a *"bounded system"*. Creswell (2007, p. 73) also has a similar view when he states that a "…*case study involves the study of an issue explored through one or more cases within a bounded system (i.e., a setting, a context)*". He previously noted that *"This bounded system is bounded by time and place, and it is the case being studied— a program, an event, an activity, or individuals" (Creswell, 1998, p. 61). S*ector-based studies have been commonly described in the referenced literature as case studies, e.g. the cotton sector in Mackrell, Kerr and von Hellens (2009). This is because a particular sector can also considered as a *"bounded system".*

To employ a case study approach, the case has to be identified and this is a challenging task (Creswell, 2007). Moreover, *"[i]t is also difficult to decide on the scope of your study"* (Collis and Hussey, 2009, p. 83). The "*bounded system*" of this study is PRM practices in Thailand's NR industry based on an RBI context. It could be considered to be a singular case study of the NR industry in the south of Thailand; the singular case study is commonly used in qualitative research (Easterby-Smith, Jackson and Thorpe, 2012). The unit of analysis is the RBIs who buy (and process) and resell NR products within the country. The phenomenon studied is the management of the price risks in their business.

Case study types in qualitative research can be categorised based on the size of the *"bounded system"* the study focuses on (Creswell, 2007). This research is considered to be an *intrinsic case study*, which is the study used in order to gain further understanding in a specific context (Stake, 2008). This is because the research seeks to understand the issue of PRM in a particular context; it is not seeking to generalise the findings as stated in the research aims.

3.5 Research Participants

RBIs located in southern Thailand were chosen to be the research participants in this study. This is because southern Thailand is the main NR producing area of the country, if not the world (Soontaranurak and Dawson, 2015). Moreover, the NR market in the south relies mainly on local traders and market-based PRM. The importance of the role of the intermediaries in supply chain efficiency is vital as they connect the millions of producers to the hundreds of exporters. However, commodity markets have become more volatile in recent years (Khin and Thambiah, 2014), which may impact on their PRM performance, which in turn affects the NR supply chain as a whole. Therefore, RBIs are the main focus of this research.

- **Snowball Sampling Application**

It is perhaps a common belief that the main purpose of qualitative research is the generation of a deep understanding and that the concern of representation is not as essential as it is in quantitative studies (Bryman and Bell, 2011). Snowball sampling is a non-probability sampling technique generally used when the research population is difficult to identify. This is in line with the fact that the official RBI population is unavailable as previously mentioned in Section 1.2.2. Though the results of this type of sampling may mean low levels of representation of the population, they have anticipated characteristics consistent with what research requires (Bryman and Bell, 2011). *"Concerns about external validity and the ability to generalize do not loom as large within a qualitative research strategy as they do in a quantitative research one"* (Bryman and Bell, 2011, p. 193). Moreover, the snowball sampling *"is associated with the interpretivist studies where it is essential to include people with experience of the phenomenon being studied in the sample"* (Collis and Hussey, 2009, p. 212). As a result, the snowball sampling technique was chosen because this research required in-depth information from RBIs, who sometimes like to keep their strategy of business secret. Therefore, a good way to obtain the desired information is to use people who one trusts and knows well in that this guarantees a level of contact with appropriate interviewees.

In the research, twenty-four RBIs were recruited, which is consistent with the suggestion that where interviews is the appropriate method for research, the number of participants is recommended to be 20 or more (Green and Thorogood, 2009), and *"[s]ingle case studies should generally contain 15 to 30 interviews"* (Marshall *et al.*, 2013, p. 20). As a consequence, this enhances the research creditability due to the possibility of approaching saturation in terms of information and the knowledge generated. The three snowball chains used in this research are shown in Figure 3.2.

Using the snowball sampling technique, the RBIs were recruited from the southern region of Thailand. The first link in the chain was introduced by an alumnus of Suratthani Rajabhat University, where the researcher works. The second and third links were introduced by the facilitator and one of the members of a discussion board on the website, *'rakayang.com' (Rakayang, 2012)*, where rubber price information and price movements are actively discussed by, mainly, RBIs and other rubber chain players on a daily basis. It is worth noting that *'rakayang'* in Thai means *'rubber price'*. Therefore, it is the potential place for attracting those who are interested in rubber prices. Although the snowball sampling method is criticised for its bias issues (Cohen and Arieli, 2011), the sources encountered through the snowball method may permit the researcher to gain

access to both RBIs who tend to actively manage price risks and RBIs who may not. Moreover, the issue of bias is less problematic in the context of this research, since this research is not seeking to generalise from the findings. The recruitment was stopped when every type of RBI was recruited and the data seemed to be saturated as not much new information was found.

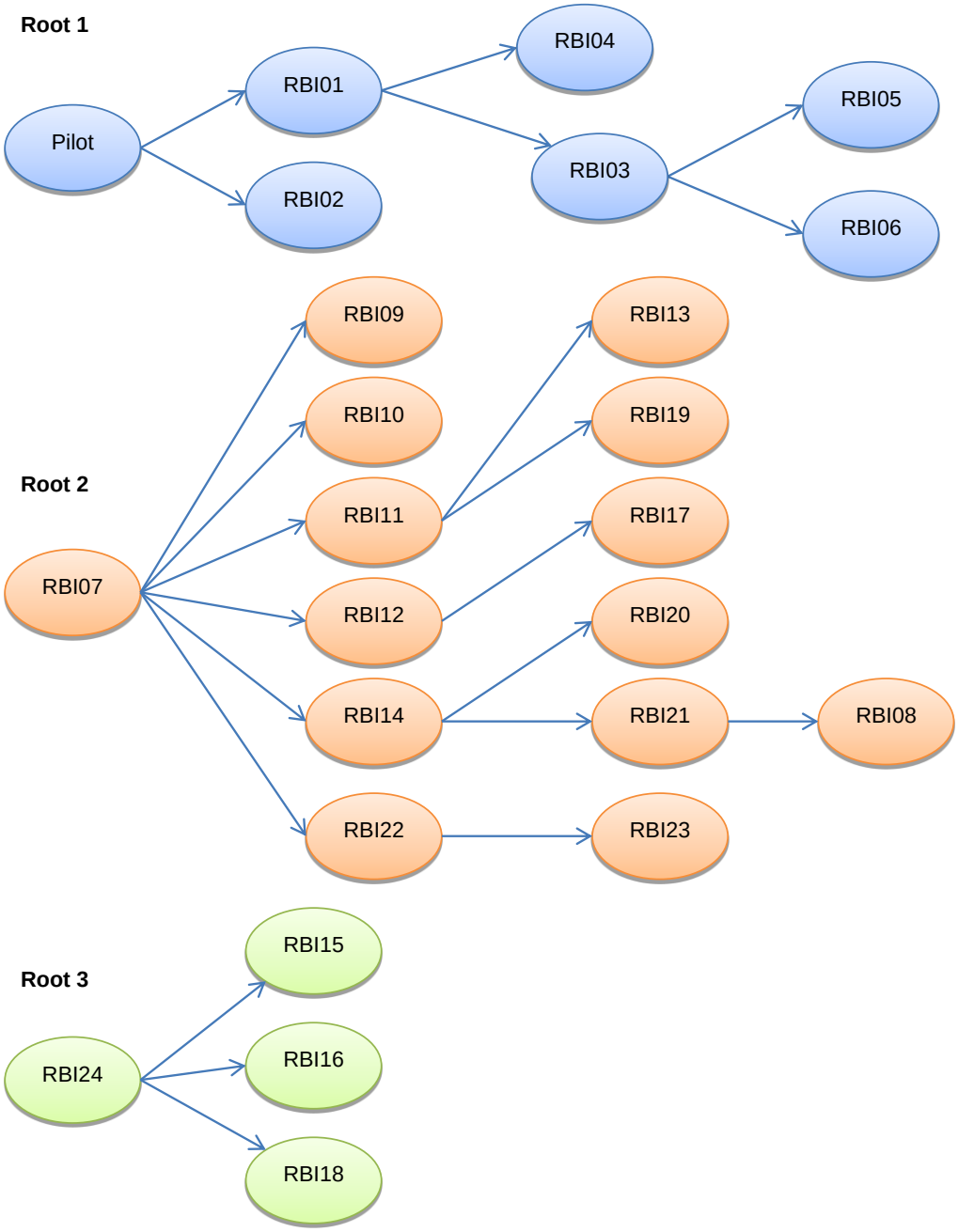


Figure 3.2: A snowball sampling illustrating research participant recruitment used in this research.

- **Recruitment Criteria**

The recruitment criteria used in this research are as follows:

- RBIs who play a role in collecting NR products from farmers or other RBIs and who resell these products to processors or other RBIs; This is because the aims of this research are focused on PRM in the context of NR supply chain players who play a role in forming a link between producers (farmers) and processors (exporters).
- RBI businesses located in southern Thailand; This is due to this research being conducted using a case study approach as a *"bounded system"*, as previously described in Section 3.4.2, in the setting of the NR sector in the south of Thailand.
- RBIs who trade in latex, cup lump, rubber sheets or who process latex into rubber sheets; In keeping with the nature of this exploratory research, as the aim suggests, this research focuses on RBIs who trade in a range of NR products, including RBIs in which business is considered as a *"value added process"*, rather than emphasising a particular type of NR product.
- RBIs who volunteer to take part in the research. The willingness to be a volunteer is an important factor in terms of trustworthiness as a qualitative research source.

The following are the results of participant recruitment using the methods outlined above. They are presented in terms of their business locations, personal profiles and business demographics.

- **Locations**

The business locations explored during the recruitment process are geographically spread throughout southern Thailand, as seen in Figure 3.3. They are located in 20 districts in seven provinces, as illustrated in Table 3.2. This list includes the three biggest NR producing provinces in Thailand where the three main auction markets are situated. This geographical spread allows the researcher to gain a bigger picture of the RBI business in the south, even though this research does not seek to formulate a comprehensive study due to the research approach utilised.

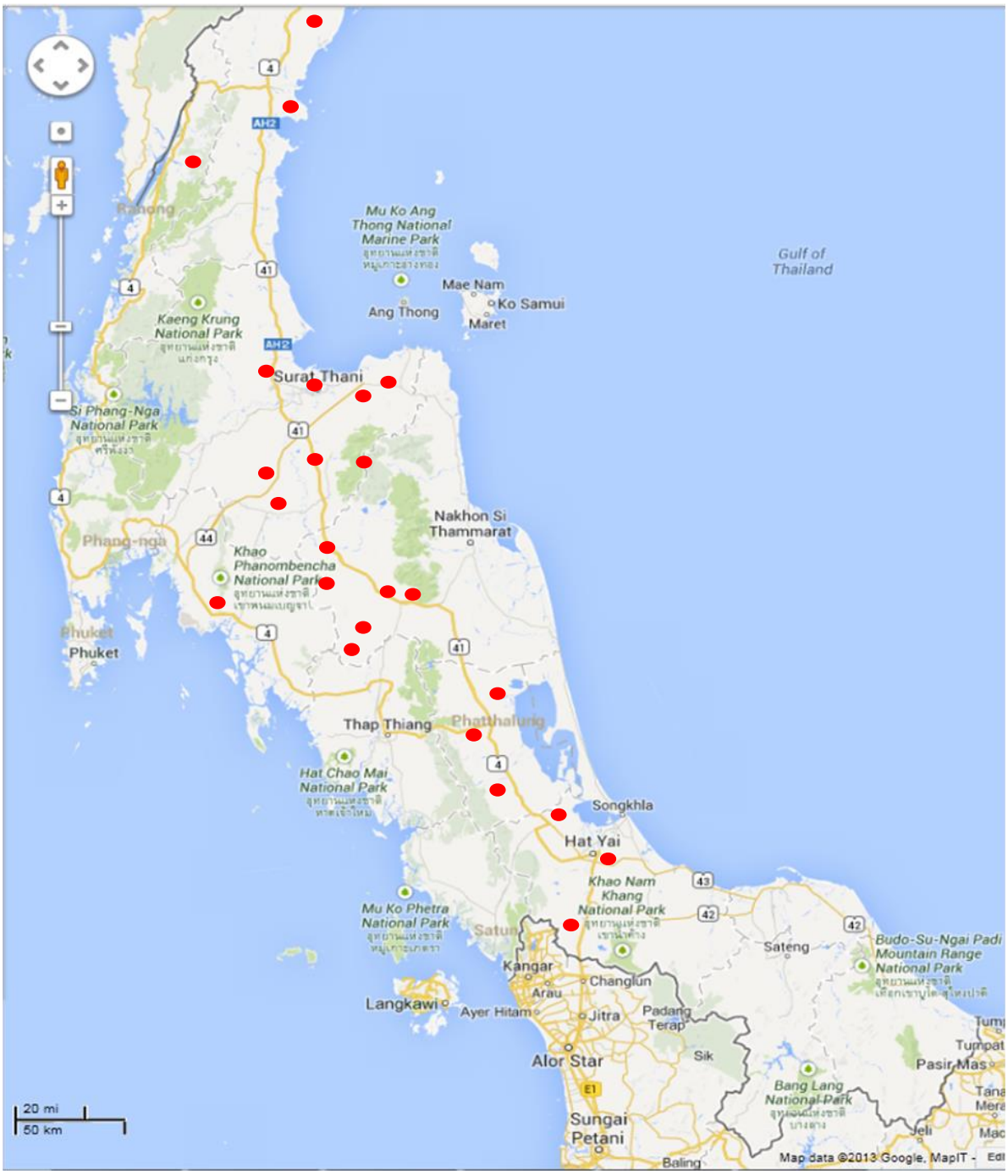


Figure 3.3: Geographical locations of research participants modified from Google Maps

Table 3.2: The locations of research participant businesses

Province	District
Surat Thani	Khian Sa, Ban Na San, Ban Na Doem, Kanchanadit, Phunphin and Mueang
Nakhon Si Thammarat	Tham Phannara, Thung Song, Thung Yai and Bang Khun
Songkhla	Khuan Nian, Sadoa and Hat Yai
Phatthalung	Tamot, Khuan Khanun and Mueang
Chumphon	Pathio and Mueang
Ranong	Kra Buri
Krabi	Mueang

- **Personal Profiles**

The research participant profiles in terms of gender, age, education, trading experience and source of professional knowledge are shown in Table 3.3. Regarding gender, for the 24 participants, nine are female and 15 are male. They are mainly over 35-years-old, with 14 of the participants aged over 40. The youngest is 29 and the oldest is 60-years-old. This range allows the researcher to study the potential differences between genders and ages in PRM behaviour.

The level of education of the research participants in this study is ranked as the following: nine hold a degree lower than a Bachelor's degree; eleven hold a Bachelor's degree with a variety of majors, such as Community Development, Education, Mechanics, Accounting, Management and Animal Science, and; four hold a Master's degree, including two participants with MBAs. However, the level of education of the participants is helpful to the research process. They have comfortability with the aims of the research and the potential complexity of the issues and questions presented. The personal profiles in terms of education vary within the types of RBI businesses. This may be because there is not a particular course of study preparing an individual to trade NR as an RBI.

Table 3.3: Research participant profiles and their business demographics

RBIs	Personal Profiles	Business Characteristics
RBI01	• Female • 47 years old • Bachelor's degree in Community Development • 20 years' experience in NR trading	• Latex (some are processed into RSS) 30,000 - 40,000 kgs/day • 9 employees • Self funding 80%, Earning from NR plantation 15% and Bank loan 5% • Business located in NR producing area, Suratthani • 1,000,000 - 1,500,000 Bath cash flow
RBI02	• Female • 47 years old • Bachelor's degree in Administration • 20 years' experience in NR trading	• Latex 30,000 kgs/day • 5 employees • Bank loan 70% and Self funding 30% • Business located in NR producing area, Suratthani • 500,000 Bath in cash flow
RBI03	• Female • 29 years old • Bachelor's degree in Management • 6 years' experience in NR trading (successive business from her father)	• Latex 50,000 kgs/day • 15 employees • Self funding 50%, Bank loan 30% and parent gift 20% • Business located in NR producing area, Suratthani • 1,500,000 Bath in cash flow
RBI04	• Female • 37 years old • A degree lower than a Bachelor's • 7 years' experience in NR trading (working in a latex company for 9 years before trading NR)	• Latex 70,000 kgs/day • 10 employees • Self funding 70% and Bank loan 30% • Business located in NR producing area, Suratthani • 1,000,000 Bath in cash flow
RBI05	• Male • 51 years old • A degree lower than a Bachelor's • 12 years' experience in NR trading	• Cup lump 100,000 kgs/day • 10 employees • Self funding 50% and Bank loan 50% • Business located in a processor's collecting point of cup lumb, Suratthani • 3,000,000 - 5,000,000 Bath in daily cash flow

Table 3.3: Research participant profiles and their business demographics (cont.)

RBIs	Personal Profiles	Business Characteristics
RBI06	• Male • 32 years old • A degree lower than a Bachelor's • 13 years' experience in NR trading	• Cup lump 60,000 - 250,000 kgs/day • USS 5,000 - 15,000 kgs/day • 15 employees • Self funding 50% and Bank loan 50% • Business located in NR producing area and a collecting point, Suratthani • 3,500,000 - 7,000,000 Bath in daily cash flow
RBI07	• Male • 58 years old • A degree lower than a Bachelor's • 35 years' experience in NR trading	• USS 1,000 -2,500 kgs/day • 1 employee • Self funding 100% • Business located in a town (a successive business), Pattalung • 300,000 Bath in daily cash flow
RBI08	• Male • 43 years old • A degree lower than a Bachelor's • 12 years' experience in NR trading	• Latex-RSS 6,000 - 8,000 kgs/day • 10 employees • Self funding 50%and parent gift 50% • Business located in NR producing area, Songkhla • 200,000 - 300,000 Bath in daily cash flow
RBI09	• Male • 41 years old • Bachelor's degree in Mechanics • 5 years' experience in NR trading	• USS 10,000 kgs/day • Cup lump 3,000 kgs/day • 5 employees • Self funding 50% and Bank loan 50% • Business located in NR producing area, Songkhla • 800,000 Bath in daily cash flow
RBI10	• Male • 43 years old • MSc in Physics (BSc in Physics) • 15 years' experience in NR trading	• USS 8,000 kgs/day • Cup lump 1,000 kgs/day • 9 employees • Self funding 100% • Business located in a town (a successive business), Songkhla • 10,000,000 Bath cash flow

Table 3.3: Research participant profiles and their business demographics (cont.)

RBIs	Personal Profiles	Business Characteristics
RBI11	• Male • 38 years old • Bachelor's degree in Education • 16 years' experience in NR trading (the third generation of successive business)	• USS 7,000 kgs/day • Cup lump 10,000 kgs/day • 3 employees • Self funding 70% and Bank loan 30% • Business located in NR producing area and close to processing factories, Suratthani • 500,000 - 1,000,000 Bath in daily cash flow
RBI12	• Female • 37 years old • Bachelor's degree in Accounting • 20 years' experience in NR trading	• USS 50,000 - 100,000 kgs/day • Cup lump 50,000 - 100,000 kgs/day • 10 employees • Self funding 70% and Bank loan 30% • Business located in NR producing area, Suratthani • 5,000,000 Bath in daily cash flow
RBI13	• Male • 60 years old • Bachelor's degree in Education • 3 years' experience in NR trading (selling his own rubber products for 23 years before trading NR)	• Latex-RSS 1,500 - 2,000 kgs/day • 6 employees • Self funding 100% • Business located in NR producing area and land owner, Nakhon Sri Thammarat • 134,000 - 200,000 Bath in daily cash flow
RBI14	• Female • 38 years old • MBA (Bachelor's degree in Accounting) • 11 years' experience in NR trading	• USS 50,000 - 300,000 kgs/day • Cup lump 500,000 kgs/month • 32 (10 officers) employees • Business located in a centre of transportation, Nakhon Sri Thammarat • 24,000,000 Bath cash flow
RBI15	• Female • 44 years old • A degree lower than a Bachelor's • 23 years' experience in NR trading	• USS 1,000 -100,000 kgs/day • 2 employees • Self funding 60% and Bank loan 40% • Business located in a town, Nakhon Sri Thammarat • 100,000,000 Bath cash flow

Table 3.3: Research participant profiles and their business demographics (cont.)

RBIs	Personal Profiles	Business Characteristics
RBI16	• Male • 41 years old • A degree lower than a Bachelor's • 7 years' experience in NR trading (selling his own rubber products for 14 years before trading NR)	• Latex-USS 5,000 kgs/day • 10 employees • Bank loan 100% • Business located in, NR producing area and a land owner Nakhon Sri Thammarat • 350,000 - 500,000 Bath in daily cash flow
RBI17	• Male • 53 years old • Bachelor's degree in Mechanics • 15 years' experience in NR trading	• USS 4,000 kgs/day • Cup lump 700 kgs/day • 3 employees • Self funding 70% and Bank loan 30% • Business located close to NR producing area, Chumpon • 1,000,000 Bath in daily cash flow
RBI18	• Female • 40 years old • Bachelor's degree in Agriculture (Animal Sciences) • 12 years' experience in NR trading	• USS 10,000 kgs/day • Cup lump 500 - 700 kgs/day • 2 employees • Bank loan 80% and Self funding 20% • Business located in NR producing area, Chumpon • 1,000,000 - 2,000,000 Bath in daily cash flow
RBI19	• Female • 56 years old • A degree lower than a Bachelor's • 5 years' experience (selling her own rubber products for 15 years before trading NR)	• USS 2,000 - 10,000 kgs/day • Cup lump 200 - 300 kgs/day • 1 employee • Bank loan 100% • Business located as the first business in the area, Ranong • 400,000 - 500,000 Bath in daily cash flow

Table 3.3: Research participant profiles and their business demographics (cont.)

RBIs	Personal Profiles	Business Characteristics
RBI20	• Male • 40 years old • MBA (Bachelor's degree in Accounting) • 15 years' experience in NR trading	• USS 50,000 kgs/day • Cup lump 500 kgs/day • 6 employees • Bank loan 60% and accumulated profit 40% • Business located in close to NR producing area, Nakhon Sri Thammarat • 3,000,000 - 5,000,000 Bath in daily cash flow
RBI21	• Male • 32 years old • Bachelor's degree in Mechanics • 6 years' experience in NR trading (his wife has over 20 years' experience in her parents' NR business)	• USS 1,000 - 10,000 kgs/day • Cup lump 200 kgs/day • 1 employee • Bank loan 100% • Business located in NR producing area, Nakhon Sri Thammarat • 200,000 - 400,000 Bath in daily cash flow
RBI22	• Male • 31 years old • Conducting Ph.D. in Mechanics (MSc in Physics, BSc in Mechanics) • 8 years' experience in NR trading (and also a consultant to NR farmers)	• Latex-RSS 1,000 kgs/day • 4 employees • Bank loan 100% • Business located in NR producing area, Pattalung • 100,000 Bath in daily cash flow
RBI23	• Male • 50 years old • A degree lower than a Bachelor's • 16 years' experience in NR trading (selling his own rubber products for 14 years before trading NR)	• USS 50 kgs/day • Cup lump 100 kgs/day • No employee • Bank loan 100% • Business located in a point that is convenient for transportation, Pattalung • 100,000 Bath cash flow
RBI24	• Male • 41 years old • Bachelor's degree in Accounting • 12 years' experience in NR trading	• Latex-RSS 5,000 kgs/day • 8 employees • Self funding 50% and Bank loan 50% • Business located in where a smoking factory is available for rental, Krabi • 350,000 - 700,000 Bath in daily cash flow

- **Recruitment Results**

The knowledge acquired from trading experience seems to be a more important source of knowledge than from formal education for the RBI business, although the method is likely to be less effective when markets become uncertain, such as when the market structure changes to become financialisation. It is clear that the majority of research participants are highly experienced in trading. More than half have ten years or more experience. The most experienced has 35 years of experience of working in NR trading. Although the least experienced has just three years' experience in processing latex into rubber sheets, he had 26 years' experience as an NR seller before he established his business.

The second source of knowledge, for some RBIs, is in acquiring knowledge from previous generations. This knowledge transfer method is a crucial source of knowledge as it is commonly known that RBI is mostly considered a family business. Four research participants can be considered as successive RBIs and one of participant is even third generation.

- **Business Demographics**

The business demographics from recruitment, as illustrated in Table 3.3, consist of all five types of RBI business, including latex, cup lump, USS and processors of latex into Ribbed Smoked Sheet rubber (RSS) and USS, respectively. It is not uncommon that one RBI may operate more than one type of RBI business; traders of USS usually also trade cup lump as some types of cup lump are by-products of USS production.

In terms of business size, the majority of RBIs participating in this study are considered to be medium to large, relative to the NR market size. At least five believed they are one of the biggest RBIs in Thailand in terms of trading capacity. This allows the researcher to study RBIs who have an active role in PRM since their trading in high volume needs means high price risk exposure. Although one RBI trades in relatively small volumes, he has more than 15 years' experience in trading. His business has become smaller as the impact of farmers in his area has changed NR production from rubber sheets, which he traded, to latex.

The number of employees is less related to trading capacity but is relevant to the type of business. It is unsurprising that RBIs who are latex processors are likely to hire more employees than other kinds of RBIs because of the need for labour to transform latex into rubber sheets. On the other hand, there are few employees in businesses that

concentrate less on processing, even though the size of the business is relatively large. Latex and cup lump businesses are positioned between rubber sheet and latex-processor RBIs as they require some level of processing.

According to Table 3.3, it is surprising that the majority of RBIs operate their business through self-funding, even though some use their overdraft service on occasions when they require additional cash. Only five use 100% bank loans to fund their business. The reason for that may come from the fact that their businesses are considered to be short-cash flow businesses, centred on latex trading on a daily basis or the immediate resale of rubber sheets. Additionally, businesses may achieve a cash injection in a period of increasing price speculation by stocking some storable products. However, latex-processing RBIs require a longer cash flow to operate their businesses, as more time is required for processing.

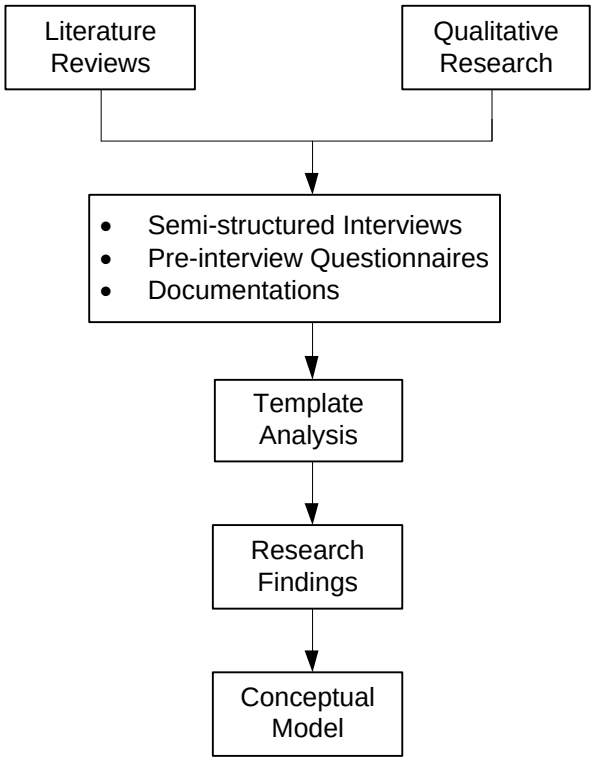


Figure 3.4: Research design of this study

3.6 Data Collection

It is common to use several methods of data collection in a case study (Robson, 2011) so that the researcher can obtain a high volume of relevant data. In order to derive data relevant to the research topic, this research utilises three data collection tools (see Figure 3.4). The semi-structured interview method is the main method used to gain the

data relevant to PRM, including PRM instruments, decision making in risk taking and market channel selection. The semi-structured interviews were conducted during June and July 2013 (as shown in Figure 3.5). The supplemental data relevant to RBIs' personal profiles and their business demographics were collected by questionnaire during the same time period. Data relevant to the NR industry, especially important price events, were collected via several published documents: the monthly TRA president's views, quarterly Sri Trang Agro-Industry Public Company Limited (STA) management analysis and discussion and annual STA reports.

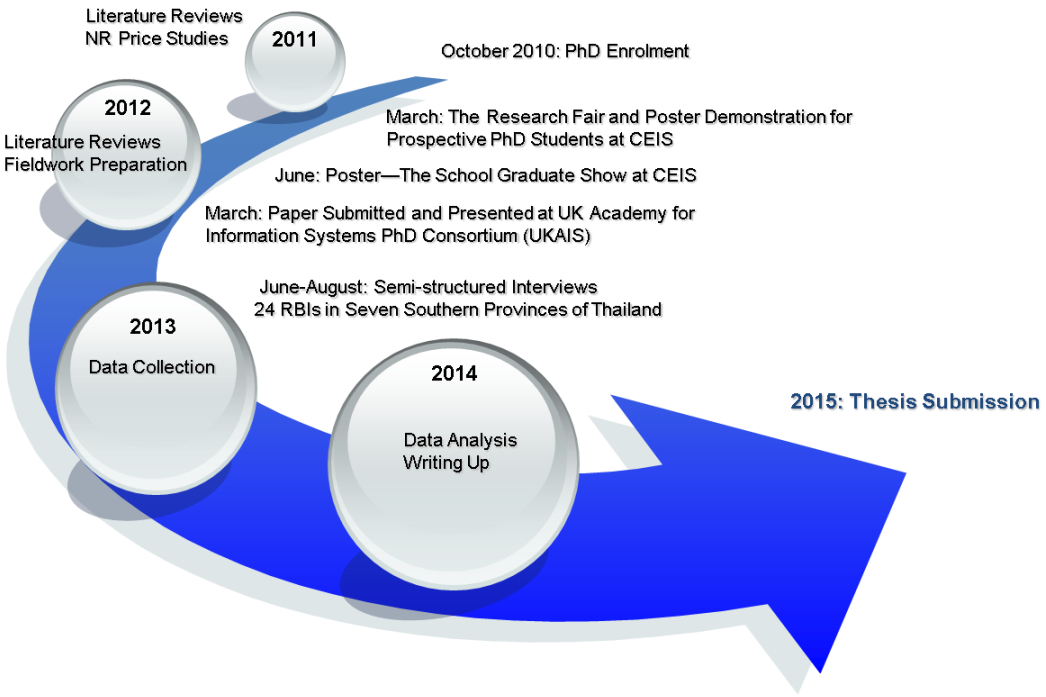


Figure 3.5: Timeline of the research activities

3.6.1 Semi-structured Interviews

According to Kvale and Brinkmann (2009, p. 3):

> *"An interview is a conversation that has a structure and purpose. It goes beyond the spontaneous exchange of views as in everyday conversation, and becomes a careful questioning and listening approach with the purpose of obtaining thoroughly tested knowledge."*

The research interview is considered a flexible method for gaining a rich amount of information. As this research aim is both exploratory and explanatory, the interview method is superior to the questionnaire method in terms of flexibility for achieving the levels and depth of data required. The nature of exploratory research is to discover things that may be unexpected at the early stage of research; the role of explanatory

research is to probe such findings to ascertain if they are relevant to the data that might be used to address the research question. The questionnaire method does not have this flexibility. This is consistent with Mulligan and Gordon (2002, p. 34) who argue that *"[t]he open-ended nature of the research question and the lack of prior research dictated an interview rather than questionnaire format"*. Although the interview method appears to be expensive and time consuming in implementation, with regard to the research aim it is worth adopting because of its ability to be modified in order to provide the richness of data relevant to the issues of the study. Additionally, the volume of textual data, its quality/details is in keeping with the desire to build theory and to generate knowledge based on the interpretivist standpoint.

A focus group was also considered as a method suitable for collecting data in this research, as this study seeks to explore and explain PRM practices from the perspective of RBIs. Although Kvale *et al.* (2009) suggest that the focus group is appropriate to the study type of new frontier exploration, this method is unable to be used in a practical way in this study due to the limitations in the ability to arrange meetings with the RBIs. This is for two main reasons: the geographical spread of the business locations and their time availability. The geographical locations of RBIs in this study are spread throughout southern Thailand, as shown in Figure 3.3. The distance from the northernmost and southernmost locations is approximately 450 kilometres. Moreover, the time availability of businesses is short window slots, resulting from the nature of their daily business trading. Their free time is unable to be determined long in advance because their trading intensity is highly dependent on the weather. Therefore, an individual interview is the favoured choice for this research.

An interview method was judged to be the main and most suitable data collection method in this research. However, there are three main types of interview method to be selected from, ranging from structured, semi-structured and unstructured interviews. According to Kvale and Brinkmann (2009, p. 130), *"the semi-structured type of interview …, the guide will include an outline of topics to be covered, with suggested questions."* Furthermore, "*the interviewee has a great deal of leeway in how to reply" (Bryman and Bell, 2011, p. 467)*. The semi-structured interview method is appropriate for this research because the research aims require rich amounts and levels of data as indicated. The structured interview requires a standard list of questions, which are pre-identified (Easterby-Smith, Jackson and Thorpe, 2012). Therefore, it is considered to be inconsistent with the aims of research to explore the issue which is still unclear. In contrast, the unstructured interview method is considered too broad as it does not require pre-identified interview questions, only the identification of particular issue(s) of

interest (Easterby-Smith, Jackson and Thorpe, 2012) and its conduction would appear to be difficult for the researcher as a novice interviewer. Therefore, the semi-structured interview was the method selected for its flexibility and prompt functions, which allow the researcher to collect the required data.

A face-to-face interview method was chosen, rather than conducting the interviews using technology. This is mainly because a face-to-face interview allows an interviewer to communicate via not only verbal but nonverbal language as well (Kvale and Brinkmann, 2009). Although a telephone interview has the advantage of collecting data from a distant location (Elmholdt, 2006 cited in Kvale and Brinkmann, 2009), this method limits communication to just the voice. Moreover, although virtual communication such as Skype is able to provide more nonverbal communication, it requires skills in using the program (Elmholdt, 2006 cited in Kvale and Brinkmann, 2009) and good internet infrastructure, which is unsuitable for this research as it was conducted in rural areas in a developing country.

This research used the semi-structured interview method as the main data collection tool. *"In both cases, the interview process is flexible. Also, the emphasis must be on how the interviewee frames and understands issues and events – that is, what the interviewee views as important in explaining and understanding events, patterns, and forms of behaviour"* (Bryman and Bell, 2011). There are four major stages of an interview as a qualitative data collection instrument: the building of the research question; the formation of the interview outline; recruiting research participants, and; conducting the interview (King, 2004a). The details of interview design and conduction follow below. For the details of the research question, see Section 3.2 and for participant recruitment, refers to in Section 3.5.

3.6.1.1 *Design of Research Interviews*

To conduct semi-structured interviews, the interview questions were constructed taking into consideration the following aspects: NR price risk, commodity PRM strategies, decisions in risk taking, commodity market channels and price risk environments. These issues were generated from the literature review (see Figure 2.1). The interview guide is the main tool used in the primary research, and full details are provided in Appendix E. Table 3.4 illustrates the main purposes of the interview questions contained in the interview guide, and the link to the sub-research questions presented earlier in this chapter.

Table 3.4: Interview question mapping

Interview Question (IQ) Number	Explanation	Research Question (RQ) to answer
IQ.1	To explore rubber intermediary business's characteristics and their function in NR supply chains	RQ.1
IQ.2	To explore how much of the current price volatility of natural rubber products is based on RBIs' perspectives and how this has changed from previous periods	RQ.2
IQ.10, IQ.11	To investigate the price transmission amongst different markets and products based on RBIs' perspective	RQ.2
IQ.8	To explore factors which influence natural rubber prices based on RBIs' perspectives	RQ.2
IQ.9	To explore the degree to which NR market stakeholders influence natural rubber prices based on RBIs' perspectives	RQ.2
IQ.3, IQ.7	To investigate the implications of natural rubber price risks on rubber intermediaries' business	RQ.2
IQ.4, IQ.5	To investigate the PRM strategies that rubber business intermediaries have employed	RQ.3,4
IQ.6, IQ.13	To investigate how RBIs make their decision to take price risks (buying, selling, stocking, hedging and pricing) in practice	RQ.3,4
IQ.1, IQ.12.2	To investigate how market channels are selected by RBIs in practice	RQ.3,4
IQ.12.1, IQ.12.2, IQ.12.3, IQ.12.4, IQ.12.5, IQ.12.6	To explore PRM instruments, market channels, price information sources, pricing methods and price forecasting methods which RBIs use in practice	RQ.5
IQ.12.7, IQ.12.8	To explore how futures markets and ICTs are used by RBIs in practice	RQ.5
IQ.14	To explore what additional support RBIs require in order to enhance their practices in PRM	RQ.3,4,5
IQ.15	To explore what additional information rubber business intermediaries wish to give	RQ.3,4,5

3.6.1.2 *Semi-structured Interview Implementation*

There were two stages in the conducting of interviews in this research. Firstly, the pilot interview was used with one RBI to test and revise the interview guide. Then, the interviews were conducted with all research participants.

The pilot interview was conducted with one RBI before conducting the interviews with all of the 24 identified participants. In this research, carrying out the pilot interview was beneficial for the following reasons:

- The prepared interview question outlines were tested on a research participant in the real context and, as a consequence, it allowed for the improvement of the research tool both in terms of making meanings and questions clearer and ensuring better time management in the interview.
- The researcher had a chance to practice the skills of interviewing in terms of asking questions effectively, asking follow-up questions and ensuring effective time management.
- It was an opportunity to gain more candidate research participants as this research employs the snowball sampling technique.
- The voice recording equipment was tested in a similar context to the real interview to test its performance and its impact on the research participant, as well as ensuring the researcher's familiarity in using the voice recording equipment (King and Horrocks, 2010).

The semi-structured interviews were mostly conducted at the working place of the RBIs; otherwise, they were conducted at a conveniently located coffee shop the research participant suggested. The time of the interviews varied subject to the interviewees' availability; interview times ranged from 40 minutes to two hours and 50 minutes (see full details of interview duration in Appendix F). The average time was one and a half hours. As a result, the total time of 24 interviews was approximately 36 hours.

- **Audio Recordings of the Interviews**

Voice recording is commonly used in qualitative interviews (King and Horrocks, 2010). In doing so, it allows the researcher to pay attention to any issues that arise during interviews, as well as the interaction between the interviewer and interviewee, since they are able to revisit details of the interview via their audio recording (Kvale and Flick, 2007). Moreover, using audio recordings allows quotes to be directly derived from the interviews and any emerging issues occurring during the interview can be precisely

captured (Bryman and Bell, 2011). In order to gain more complete information when conducting the interview, the researcher used a voice recorder to record the conversation during the interview. In order to avoid any interruptions of the interview that might arise from using the equipment, the participant's permission was obtained and the interviewer explained the confidentiality of data, as outlined in the consent form. Every research participant allowed the use of the equipment in line with the ethical standard of the University.

3.6.2 Pre-interview Questionnaire

The questionnaire was utilised in this research to gain information about participants' business backgrounds and personal profiles in order to build the connections between individuals and PRM practices. Bryman and Bell (2011) suggest that one of the advantages of using a 'self-completion questionnaire' is that research participants are able to complete it at their own pace. As a result, it is accepted that the tool allows the researcher to pay more focus on the interview's main issues.

Several important demographic characteristics of the intermediaries' rubber businesses and personal profiles were explored (see Appendix G: Pre-interview Questionnaire). Moreover, doing this separately saved time at the actual interview. These include: experiences; knowledge background; types of rubber products traded; capital, and; size of business. These factors may affect the choice of PRM strategies. Therefore, the linkages between such factors and management strategies were investigated.

A pilot was also conducted for the questionnaire with the purpose of checking for clear meaning and any important issues that may have been ignored. The result of the conducted pilot questionnaire showed that there was no need to change it, as it was intentionally short and uncomplicated.

Given the short length of the questionnaire, each research participant spent around only 15 minutes on its completion. This occurred before the interview took place as some information was considered helpful for the interviewer to know in advance, such as the types of NR products the participant traded and their company's trading volume. However, some of the research participants were unable to provide some information that they thought was sensitive, such as the level of business capital or the amount of rubber plantation owned by them, although several revealed more information during the interviews.

3.6.3 Documents

To gain further understanding of relevant events discussed during the RBI interviews, several documents that mention the events were collected. In this research, there were three main sources of documents that were collected: the monthly TRA president view (Thai Rubber Association, 2013), the quarterly management discussion and analysis report (Sri Trang Agro-Industry Public Company Limited, 2013b) and the annual report of the STA (Sri Trang Agro-Industry Public Company Limited, 2013a). The TRA is the association of Thai NR exporters whilst the STA is the largest public company of NR processors and exporters in Thailand listed in the stock exchange. These three documents are freely accessible on the internet although some older versions of the TRA president's view were provided by the TRA. A result of different sources of documents and timescales in publishing increases the chance of discovering relevant information to price events mentioned by research participants from the documents. The TRA president's views were chosen as they are published on a monthly basis. Therefore, when combining them with quarterly management analysis and discussion and annual reports of STA, they are able to provide relevant information concerning any important events of the NR industry in a chronological way. As a consequence, the isolated stories of the NR industry from the research interviews can be more integrated into the main story of NR prices.

The documents were analysed mainly in order to extend the understanding of the price events mentioned in the interviews with research participants. Therefore, the template of analysis was built based on price events taken place in the interviews. Eventually, the events together between two sources of data were able to be linked.

Furthermore, the derived documents were also used to triangulate data from the interview to consider the similarities and differences of data from two sources. Although this is not the main purpose of this research, as the research adopted the interpretist paradigm, which acknowledges a multi-reality, it is useful for this research to double-check some factual information of which the research participants may be uncertain; for example, the actual time of price events that may be difficult to remember.

Last but not least, the documents were also utilised as literature to set the context of the case study and to discuss research findings.

3.7 Data Analysis

The main analysis method of this research is a template analysis. Although a descriptive analysis was employed for personal profiles and the business demographic data of the research participants, it was only used for classification purposes. As data collected by the pre-interview questionnaire are in relation to RBIs' profiles and business demographics, it was used for investigating the potential relationships to emerging themes from the interview transcripts. This can be used as a node classification in template analysis using NVivo. Such a function in NVivo enables the personal and business characteristics to be conveniently linked to the main substantial and rich data derived from the interviews. Details of the template analysis, the rationale for using this method and how it was used in this research, including the use of NVivo as the software for analysis is provided below.

3.7.1 Template Analysis

Template analysis is the thematic analysis method compatible with different types of epistemology adoption (King, 2004b), including the interpretivist approach this research adopted. This flexibility is considered to be one of the benefits of using template analysis to fit the requirement of a specific field of study. Moreover, it is common to use template analysis in analysing the transcripts of personal interviews (King, 2012).

In this research, template analysis was applied to interview data, pre-interview questionnaires and documents in textual form (see Figure 3.4). The preliminary template from the coding of a sub-sample of interview data was applied to the whole sample in order to build up the initial picture to an understanding of the interview findings. The revisions from the previous results were continuously conducted until there is no data related to the research questions left without being coded (King, 2004b). This research applied this technique in order to gain data and knowledge concerning RBIs' current NR market structures, RBIs' roles, price risk and its implications, price risk environments and PRM practices from the specific context of the research.

Regarding the sample number of research participants in this study, 24 in total, template analysis was selected, rather than the alternative method of Interpretative Phenomenological Analysis (IPA), since *"IPA studies are commonly based on samples of 10 or fewer; template analysis studies usually have rather more participants, 20 to 30 being common"* (King, 2004b, p. 257). Moreover, IPA offers a more intensive analysis

than template analysis and this does not fit this research's aim for a broader analysis given the range of issues addressed during the interviews.

3.7.2 NVivo and Template Analysis

"Without question, given the central role of coding in most programs, analytic approaches using this, and that includes ... template analysis ... are served best by the software" (Gibbs, 2013, p. 289). Software in qualitative data analysis, known as Computer Aided Qualitative Data Analysis Software (CAQDAS), is helpful in several aspects; for example, in data management when dealing with large and messy qualitative data. To manage qualitative data in analysis efficiently, consistently and systematically, CAQDAS is needed because it can deal with data of a large size and complex structure (Gibbs, 2007). Easterby-Smith, Jackson and Thorpe (2012, p. 171) indicate that:

> *"All CAQDAS packages have a general array of tools that make structuring and managing large volumes of data easier and, further, can increase the accessibility of data".*

Moreover, CAQDAS may be also useful in terms of increasing the quality of data analysis. For example:

> *"The use of CAQDAS packages, particularly for their data management and functionality and capacity to increase accessibility, can help the researcher get 'closer' to data while also increasing the accuracy, transparency and overall rigour of the data analysis process and outcomes" (Easterby-Smith, Jackson and Thorpe, 2012, p. 171).*

However, when deciding to use CAQDAS, the costs and benefits of applying it need to be considered. In the case of insignificant research data size, learning to use CAQDAS for use in the project may not represent a good choice as understanding the program takes some time and effort, except that learning it now could be useful for use in future work (Bryman and Bell, 2011).

The benefits and costs of using CAQDAS are discussed extensively by Atherton and Elsmore (2007). In this research, it could be argued that the benefits of using CAQDAS outweigh the costs, especially in terms of its value in the iterative process of revising templates from the initial template into the final template as this research adopted the template analysis. Using CAQDAS would ensure that a huge amount of time could be saved from a number of rounds of template revisions to reach the final version. Moreover, the interview data in this research is large, since, according to King and

Horrocks (2010), the transcripts of interviews over 30 hours are considered to be large qualitative data and the total in this research is around 36.

King (2004b) argues that using software in qualitative data analysis allows analysts to produce high-quality work. Although judgement and interpretation come mainly from analysts themselves, the support from data organisation and examination is useful in facilitating an in-depth and sophisticated analysis. Compared with the manual analysis of the qualitative data, NVivo performs better when analysing large amounts of data (Zamawe, 2015). This is consistent with the interview transcripts of this research which amount to just over 600 pages. Although the tool does not directly help in interpreting the situation during data analysis, it can be argued that such a tool may help the researcher to focus more on the main task of interpretation due to the ease of data manipulation compared with the manual method. Therefore, the method is suitable for this research and was selected as an analysis instrument.

NVivo is the software this research has utilised for analysing qualitative data (see an example of NVivo snapshot as shown in Appendix H). This software is accessible to the researcher through Northumbria University; the University also offers a range of training sessions in how to use the software. The program is used in this research not only in terms of analysing data but also for planning, organising and presenting the results of the analysis.

3.7.3 Data Analysis Process

This section focuses on the process of data analysis this research utilised. There are four main stages: transcription; initial template building; template creation, and; the final template. There are three main stages of the template analysis method: the initial template building, template revisions and the final template decision (King, 2004b). However, a preliminary stage needs to be completed prior; this includes transcribing the audio interview recordings into textual form and this is the actual first step of data analysis since it allows the researcher to gain familiarity with the data. Further details of each stage are as follows:

- **Transcriptions**

According to Kvale and Flick (2007, p. 93), transcription is *"… to transform, to change from one form to another"*. Since the main data of this research were derived from interviews and were in the form of audio files, the data needed to be transcribed as a verbatim transcription into a textual form for convenience in the analysis. The data were

then analysed by the method of template analysis in the next stage. Around 36 hours of interview audio recordings were transcribed into just over 600 pages of transcripts (see examples of interview transcripts in Thai in Appendix I, and in English in Appendix J). Considering the substantial amount of transcripts, the NVivo software was selected as a tool of analysis as it is helpful in terms of the ease and flexibility of its data organisation. One of the advantages of transcription is that the researcher gains familiarity with the data, which is coded in a later stage of the template analysis.

To minimise the distortion of the original meaning in the interviews from variations resulting from translation, this research analyses the derived data in the original Thai language. Moreover, fortunately, the NVivo version 10 allows transcripts in Thai to be analysed. The other reason for doing this is the fact that the translation of the interview transcripts from Thai to English and then the backward translation from English to Thai for validation purposes is impractical due to the large volume of transcripts and the limited time available to a PhD candidate. As a consequence, only some parts of the interview transcripts which are used in direct quotations have been translated into English and validated through the use of backward translation.

- **Initial Template**

The a priori code built in this research was divided into two stages. Similar to that used in one of the projects described by Waring and Wainwright (2008), the first version of a priori code (see Appendix K: The A Priori Code) was conducted based on the issues from the interview outline (as shown in Appendix E) whereas the second version (see Appendix L: The Initial Template) was derived from applying the first version to a sample of interview transcripts. As a consequence, although the a priori code was able to capture the relevant issues that could help address the research question, it may have missed some emerging issues that were raised after the data collection had taken place. Therefore, the second stage of initial template building was necessary as it made the template closer to what was derived from the research data.

In the second stage, after reading and re-reading the interview transcripts, five transcripts were selected based on the types of NR traded in order to create the initial template. The data relevant to the research question was coded and organised the code structure, considering the relationships amongst the codes. An example of the initial template applied to the five transcripts is showed in Table 3.5. The template also includes the information ascertained from the questionnaire concerning personal profiles and business demographics. This is consistent with this research being conducted with

an inductive approach. Finally, this template was applied to the remaining transcript data in the following step, so that the more comprehensive information relevant to this research could be captured.

Table 3.5: An example of the initial template

Themes	Codes
PRM Strategies	Stock Holding
	Back-to-back Selling
	Forward Selling
Decision Making in Risk Taking	Marketing Opportunity
	Sourcing Ability
	Business Environment
Market Channel Selection	Types and Grades of Products
	Customer Requirements
	Operational Costs

- **Template Creation**

King (2012) recommends that the derived initial template has to be systematically further applied to the rest of transcripts so that all the relevant sections of the transcripts can be identified and included in coding. The process of template revisions involves inserting, deleting nodes, merging, reducing or extending the node boundaries and altering hierarchical node orders (see an example of coding tree in Appendix M). This stage is crucial in data analysis because uncoded transcripts may be added or a new idea may emerge. The process in this stage is iterative in order to improve the template to bridge the research data and the research question. This process requires flexibility in the data organisation process as additional data may lead to changes in ideas, which usually occur several times. Hence, tools that help to reduce the time needed to complete each round of this stage are valuable as it may take a number of rounds until the relevant data derived from the data collection process can be utilised to address the research question.

The initial template was applied to every interview transcript to observe the similarities and differences in individual codes from different research participants. The rest of the uncoded transcripts were considered new nodes if they were relevant to the research question. Not only were the new codes added to the template but, occasionally, the existing nodes were merged together or even deleted from the template. The template structure was occasionally re-organised according to the changes in ideas. Therefore,

this stage of template building is known as *'template revisions'*, as the nature of this stage is that the template may change over time because of new data additions and changing ideas.

- **Final Template**

King (2012) suggests that it is difficult to judge the template as final as there are usually several parts that can be changed. He points out that:

> *"...no template can be considered 'final' if there remain any sections of text that are clearly relevant to the research question but stay uncoded" (King, 2012, p. 444).*

The template was finalised after several rounds of revisions until the analysis reached the saturation stage based on the criteria of all research questions being addressed and all relevant data in transcripts being coded. Then, the final template (see in Appendix N) was used for constructing findings chapters in this thesis, i.e. Chapter Four, Five and Six. An example of the final template applied to the interview transcripts is illustrated in Table 3.6.

Table 3.6: An example of the final template

Themes	Codes	Sub Codes
PRM Strategies	Stock Holding	
	Back-to-back Selling	
	Forward Selling	
	Negotiation	
	Portfolio Management	
	Alternative Product Marketing	
	Adaptability	
Decision Making in Risk Taking	Marketing Opportunity	Current Market Condition
		Expected Price Movement
	Sourcing Ability	Stock Holding
		Season and Weather
		Ease of Sourcing
	Stocking Ability	Capital
		Warehouse
	Hedging Ability	Accessibility of Price Risk Management Instruments
	Business Environment	Competition

Table 3.6: An example of the final template (cont.)

Themes	Codes	Sub Codes
	Business Partners	Suppliers' Decisions
		Exporters' Decisions
	Financial Situation	Debt
		Loan
		Alternative Sources of Incomes
	Business Performance	Previous Decision Result
		Gains and Losses from Physical Holding
		Gains and Losses from Market Positions
	Personal Profile	Age
		Trading Experience
		Attitude toward Price Movements
Market Channel Selection	Types and Grades of Products	
	Customer Requirements	Given Prices
		Grading Systems
	Reliability of Scales	
	Operational Costs	
	Reliability of Payment	
	Convenience	
	Provided PRM Instruments	

3.8 Trustworthiness

There remains a debate on the issue of criteria in qualitative research assessment. Rolfe (2006) suggests that it should depend on researchers themselves to judge the criteria of evaluating their research quality rather than searching for a universal rule. As a result, to ensure the quality of this qualitative research, trustworthiness was used as a criterion in assessment. There are four elements of trustworthiness that were focused on: creditability; transferability; dependability and confirmability (Rolfe, 2006; Bryman and Bell, 2011). A variety of methods were used in this research in order to ensure the trustworthiness of the research. Further details for each consideration are presented below:

3.8.1 Creditability

Rolfe (2006) notes that creditability being achieved in an interpretivist study is similar to *'internal validity'* being achieved in a positivist equivalently. Symon and Cassell (2012) add that creditability is the demonstration that *"constructed realities of respondents and the reconstructions attributed to them"* (Guba and Lincoln, 1989, p. 237) is well fitted enough, instead of attempting to seek the fittest amongst them.

A number of measures were employed in order to ensure the creditability of this research. One of the main issues of this research that the researcher had to deal with was the fact that the research was carried out in Thailand. Therefore, to gain rich and accurate data, the data collection was undertaken in Thai. As a consequence, the relevant documents and data were translated from one language into another, although only some parts of interview transcripts which are used in direct quotations were translated into English. The measure used in order to maintain the accuracy of documents in both languages was the back translation method. This process was aided by the help of two full-time Thai PhD students conducting research in the U.K.

Apart from the accuracy of the translations of English-Thai and Thai-English, some research tools, such as interview question outlines and questionnaires, were developed in consultation with a senior Thai researcher who works at the same University as the researcher. This process was used to ensure the understanding of research participants regarding the questions in both the interview and questionnaire as they normally use a local language, which varies slightly from formal Thai. As a result, a number of words in the interview outline and questionnaire were slightly modified and they were also checked against the original version in English to ensure accuracy.

To deal further with the issue of communication accuracy of the research tools, a pilot for using the tools was conducted. Several suggestions during this stage were helpful in improving the tools and the potential research participants. As a consequence, several questions were improved in order to communicate more clearly.

After the data were collected, the audio recordings of the interviews were transcribed into text form in order to analyse them at a later stage. To improve the accuracy of transcription, double-checking of transcripts was employed in this research. This is also helpful for the researcher in the stage of data analysis in terms of data familiarity. Certain parts of the audio recordings were checked with the transcripts by the two Thai PhD students.

One of the advantages of multi-sources of data is facilitation of a triangulation process, as this enables the detection of supplementation or conflicts amongst the sources. As this research was conducted in the context of business, certain sensitive questions in the questionnaire were avoided by research participants. Several added more detail during the interviews when they gained more familiarity with the researcher as the interview progressed. Occasionally, they even revealed the information that they had avoided providing in the questionnaire answers in the first stage; for example, the questions asking for details of their alternative incomes or the rubber plantations they own. Triangulating the data from these two sources means a higher accuracy of data collection can be achieved.

Following the analysis stage, during the process of writing up the findings, the supporting evidence of the findings and the direct quotations of participants' interview transcripts were translated from Thai to English. Again, the back translation method was employed but instead of from Thai to English, as in the first stage of the research, this time the translation was from English to Thai (see examples of these Thai and English versions of quotations in Appendix O).

3.8.2 Transferability

Rolfe (2006) argues that transferability in interpretivism is consistent with the term *'external validity'* in positivism. This is consistent with Symon and Cassell (2012, p. 207), who state that:

> *"With reference to transferability, rather than trying to demonstrate that the results generalize to all other contexts, the researcher provides enough detail about the specific research case...that the reader can judge what other (similar) contexts... might be informed by the findings".*

It is argued that a case study bounds the results of a study to remain applicable only within the case and no further than that, as generalisation is not the aim of case study research (Bryman and Bell, 2011). Although this research is not seeking to generalise the findings, given the nature of the research methodology adopted, the transferability of the findings and also the research approach itself to a similar context is possible. Those business communities, particularly in emerging economies, trading in commodities that rely on low margins and high volume trading may adapt the conceptual findings from this research in order to gain a better understanding of PRM practices, especially in the context of commodity intermediaries. This may include NR markets in other parts of Thailand, such as the north and north east, as well as Thailand's neighbouring countries such as Vietnam, Laos, Cambodia and Myanmar where numbers of NR plantations have

significantly increased in recent years (Much, Tongpan and Sirisupluxana, 2011; Sturgeon, 2013; Fox *et al.*, 2014; Soontaranurak and Dawson, 2015).

3.8.3 Dependability

Rolfe (2006) links dependability in interpretivism to *'reliability'* in positivism. According to Symon and Cassell (2012), dependability is illustrated by how *"methodological changes and shifts in constructions"* (Guba and Lincoln, 1989, p. 242) are ensured based on the chosen measures employed in the research.

The records of documents have been kept in forms that are traceable to ensure that if another researcher would like to re-do the same research, the results could be compared. For example, the transcripts and audio recordings from the same interview are saved in the same file name so that it can be noticeable, even though the participants are anonymous and the data they provide is confidential. For the interviews conducted in Thai, the documents of both the originals and the translations are saved under the same name in order to be matched as being traceable. The templates derived from the coding in the data analysis have been saved for each version from the initial to final template, so that anyone is capable of tracing the different iterations.

In addition, for the quotations noted during research that were originally in Thai and translated into English, both versions of each quotation are saved together. As a consequence, the quotations can be rechecked for accuracy and integrity of translation.

3.8.4 Confirmability

Rolfe (2006) notes that confirmability is mostly involved in the presentation of research results. Symon and Cassell (2012, p. 208) define a confirmability audit as:

> *"...seek[ing] to make clear where the data came from...and how such data were transformed into the presented findings".*

In order to ensure that the views of each research participant have been heard and noted, the relevant transcripts of each node of coding were checked to ensure that no relevant data were left without coding. This was achieved by the template analysis method used in the research. Another measure utilised was ensuring that the resulting template from the analysis was consulted closely by the supervision team. The research findings were discussed alongside other relevant work in order to compare and contrast the similarities and differences amongst the studies. Moreover, in terms of research findings (Chapters 5, 6 and 7), the node diagrams derived from the data analysis are

used to present and direct quotations from the interview transcripts in order to support the findings throughout the chapters.

3.9 Ethical Issues

This section is relevant to the methods used in this research for dealing with relevant ethical issues. (Blumberg, Schindler and Cooper, 2014, p. 121) state that:

> *"Ethics is the study of the 'right behaviour' and address the questions of how to conduct research in a moral and responsible way."*

The three main aspects of ethics are as follows: access, informed consent and anonymity and confidentiality.

3.9.1 Gaining Access

The challenging issue for gaining access to potential research participants is different for each topic of research (King and Horrocks, 2010). This research topic requires data relevant to an individual's trading strategy, which can be considered sensitive data to some research participants. As a consequence, some participants may be reluctant to provide such information to a researcher who is, essentially, a stranger. Therefore, a technique to deal with such an issue is needed. Creswell (2007, p. 123) explain that:

> *"Gaining access to sites and individuals involved several steps. Regardless of the approach to inquiry, permissions need to be sought from a human subjects review board, a process in which campus committees review research studies for their potential harmful impact on and risk to participants."*

Additionally, all research participants in this research were over 18 years of age. The data was collected through the use of pre-interview and interview methods. Therefore, this research was conducted in line with University policy.

This research employed a snowball sampling method to recruit the research participants. Therefore, excepting the chain root, the participants were introduced to the researcher by already-recruited participants. The process of recruitment includes informing the recruited participants of the participation criteria in order to ensure that the candidate RBIs were eligible. Then, the introducers contacted the candidate RBIs in order to ask them to volunteer. If they agreed to participate in the research, the researcher then contacted them at a later date to hand in the contact letter (see Appendix P: Contact Letters with RBIs) arrange the place and time of the interview.

The roots of the snowball process for this research included a university alumnus who was introduced to the researcher by a colleague; she was willing to be a volunteer for the pilot interview and she then introduced the researcher to other members of the chain. The other two roots of the snowball process were contacted via a discussion board that focuses on rubber prices. It was evident that all RBIs operated their own business; therefore, they did not need to obtain permission to participate in the research from anyone else in their company.

3.9.2 Informed Consent

A consent form is a crucial part of conducting research ethically. As stated by Crow *et al.* (2006, p. 83):

> *"The principle of informed consent requires that prospective participants in research are provided with information about the project in which they are being invited to participate that is sufficiently full and accessible for their decision about whether to take part to be considered informed."*

In order to maintain a balance of power between the research participant and the researcher, the project information sheet (see Appendix Q) and consent form (see Appendix R) were distributed and explained to the participant by the researcher. The participant was then able to ask questions if anything remained unclear. If the participant wished to participate in this research, the researcher explained the rights of the participants before the consent form was completed and signed off, prior to the questionnaire being returned to the researcher. The University's consent form, *'Northumbria University CEIS Research Ethics Sub-Committee CONSENT FORM – C'* (as shown in Appendix R), in a paper-based format was utilised in this research. Therefore, this research complied with standard research ethics in terms of the consent form. Moreover, ethical clearance for this study was provided by the University before the primary research was conducted.

3.9.3 Anonymity and Confidentiality

It is important to conduct research that will not impact on informants as a consequence of their providing information. One of the crucial measures to ensure this is to keep their names unidentifiable, so that their opinions cannot be traced (Collis and Hussey, 2009). According to Collis and Hussey (2009, p. 46):

> *"Anonymity provides protection to participants by ensuring that their names are not identified with the information they give".*

In terms of research participant protection, their names were anonymised, so that their identity cannot be revealed. Therefore, it is only the researcher who can match the data and the data sources (research participants). As a consequence of the measure applied, the research participants have been protected in accordance with the research ethics. Collis and Hussey (2009, p. 46) note that:

> *"Confidentiality provides protection to participants by ensuring that sensitive information is not disclosed and the research data cannot be traced to the individual or organisation providing it".*

Regarding confidentiality, all data will be stored on a secure hard disk and U-Drive. The researcher's username and password will be required to access them. All hard copies will be kept in locked cabinets. All data in this project will be destroyed after the project is concluded, including the shredding of hard copies and the deleting of electronic files that contain any data.

3.10 Chapter Summary

This chapter deals with the design of this research in terms of the rationale of the research paradigm, the methodology and method selection and application. This research adopts an interpretivist paradigm as the research question relates to the complexity of PRM behaviours of RBIs when dealing with account price volatility. Therefore, the truth is based on multi-subjectivity and the researcher needs to become involved in the phenomenon in order to build their knowledge about the issue. A case study defined in terms of the rubber industry sector in the south of Thailand and qualitative research were utilised in this study as this phenomenon requires research to be conducted in a live context; thus the researcher collected qualitative data, mainly using semi-structured interviews, to address the research question. Research participant profiles and their business demographics were collected by the pre-interview questionnaire. The derived qualitative data of this research were analysed using the template analysis method and NVivo software.

In order to ensure the quality of this research, trustworthiness was used as assessment criteria. It comprises of four main aspects: creditability; transferability; dependability and conformability. This research was conducted in compliance with University ethics. Thus, consent form and information sheets were distributed during the data collection process in fieldwork to ensure the balance of power between research participants and the researcher. Anonymity and confidentiality were also applied throughout the research

project in order to protect participants from any potential impact that may occur through their participation and provision of data.

The following chapter presents the research findings with regard to NR business intermediary classification and supply chain structures.

Chapter 4 RBI Classification and Supply Chain Structures

4.1 Introduction

Regarding the types of NR products they trade, services they provide and market structures, RBIs can be classified into five categories: USS, Latex, Cup Lump, Latex-RSS and Latex-USS business intermediaries. USS, Latex and Cup Lump business intermediaries are traders who buy and sell USS, latex and cup lump products, respectively. Latex-RSS and Latex-USS business intermediaries are processors who buy latex as a raw material and then transform and sell it as RSS for the former, and USS products for the latter. It is worth noting that some RBIs run more than one type of NR business.

RBIs are the linkage between NR farmers and NR processors. They serve the farmers by exchanging NR products with cash. Conversely, they serve NR processors by sourcing the NR products. In addition to the two obvious services mentioned previously they also provide five other services to the NR supply chains: grading, transport, marketing, processing and supply management. The services they provide are varied based upon the five different types of supply chains, as shown in Figure 4.1 below.

USS, Latex, Cup Lump, Latex-RSS, and Latex-USS intermediaries are illustrated in Section 4.2, 4.3, 4.4, 4.5 and 4.6, respectively. In these sections, quotations from interview transcripts from the research participants are available in Appendix S as indicated in the text. The final section, 4.7, provides a summary of this chapter.

4.2 USS Intermediaries

USS, made from field latex, is the traditional NR product produced in southern Thailand because the majority of NR producers are small farmers. The popularity of this NR product is partly because it can be held in stock for some time before being sold. This is because small famers can only produce a small amount of USS per day. Moreover, if people would like to stock the products for speculative reasons, USS can be stocked for months with a lower risk of weight lost and product deterioration relative to other NR products. This makes the USS market structure derived from this research, as illustrated in Figure 4.2, the most flexible in the five types of NR markets found in this research.

USS was the main NR product before the introduction of cup lump and latex markets, which have simpler producing methods. One of the RBIs, who had a trading experience over 30 years, mentioned that: *(please refer to APPX_S_401 in Appendix S).*

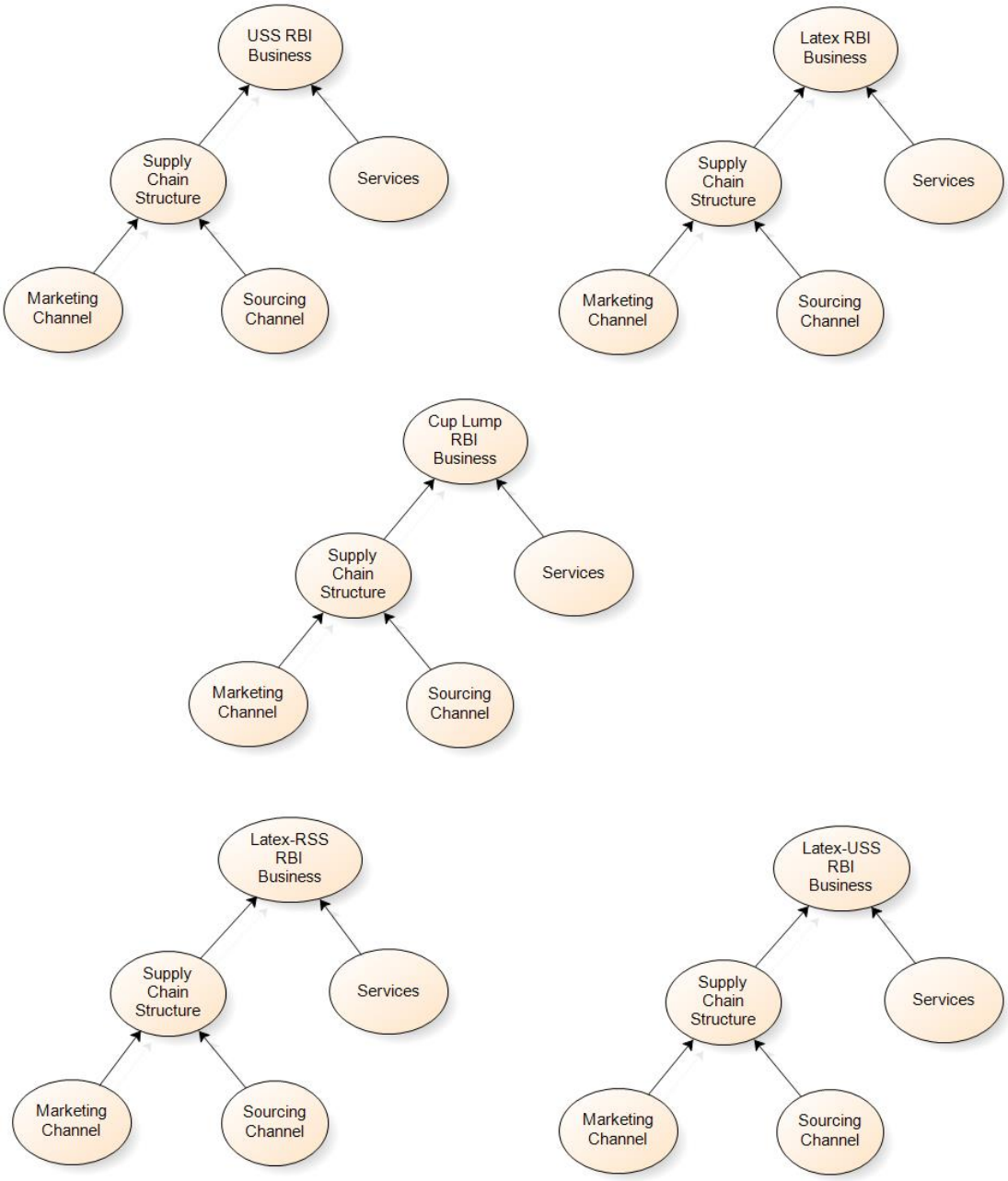


Figure 4.1: The final template of supply chain structure and services of a particular RBI business type

USS intermediaries commonly buy USS products from USS producers primarily from NR farmers and Latex-USS intermediaries. They resell the products to bigger USS intermediaries and, sometimes, to USS processors directly, or sell them via auction markets if the USS grade meets the market standard. However, it is not unusual if they trade amongst USS intermediaries or buy the USS products from auction markets as the reselling properties of USS allow them to be speculative. RBI12 explained that: *(APPX_S_402).*

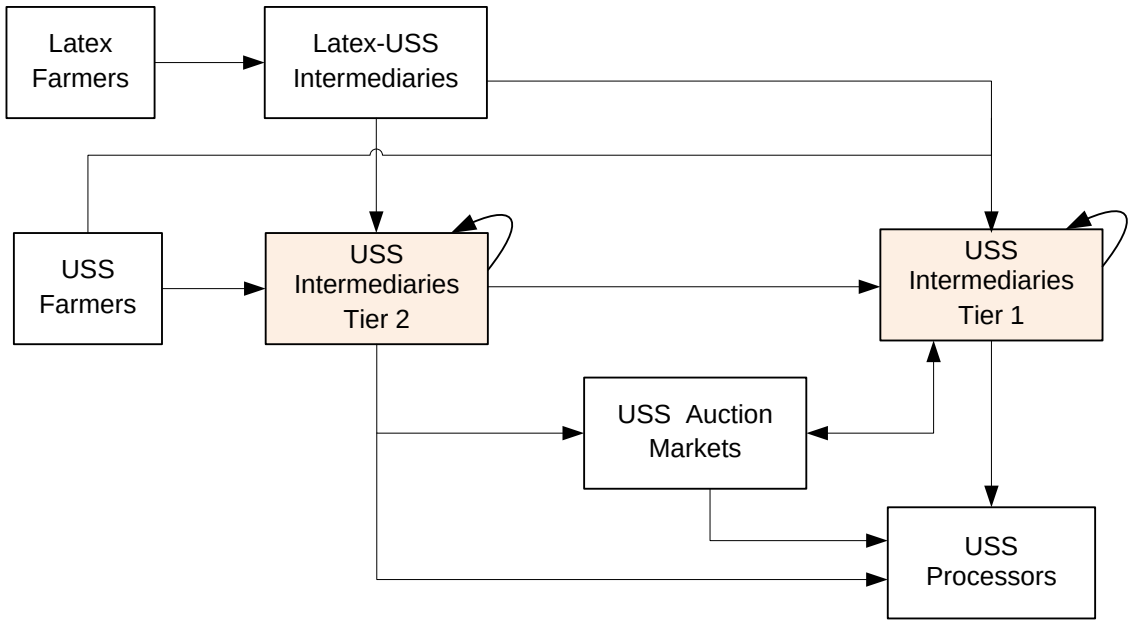


Figure 4.2: USS intermediaries' supply chain resulted from this research

There are two types of USS intermediaries in the NR supply chain, as shown in Figure 4.2. USS intermediaries are classified as either Tier 1 or Tier 2, depending on how the services they serve are close to the processors or farmers. Tier 1 USS intermediaries are mainly sourcing USS products for the USS processors. They usually have forward contracts with a good price before they begin sourcing USS products. Therefore, they trade with high volumes and have high marketing power in negotiations to USS processors. In this case, buying USS from auction markets is the main factor as they could buy a high amount of USS.

In contrast to Tier 1, Tier 2 USS intermediaries mainly serve NR farmers by buying USS products when the farmers want to sell instead of when processors want to buy. As a consequence, they have to hold the stock for some time before they decide to sell to markets when it is profitable. Thus, the Tier 2 USS intermediaries tend to be exposed to price risk more than the Tier 1 during periods of price downtrends.

A sourcing activity is one the main services that USS intermediaries provide. Collecting small amounts of the product from smallholders, who are the main producers of NR in southern Thailand, or small traders (who hold USS stock by buying the product from local farmers) is crucial. The USS product is produced by over half a million small farmers and is exported by just over a hundred exporters. This results in complex sourcing in terms of building up the product volume. Although there are auction markets that provide sourcing services for the exporters, only a small proportion of USS is sold

via auction markets. The rest rely on the intermediaries' services or resell directly to USS processors. One of the USS intermediaries revealed that: *(APPX_S_403).*

Moreover, in their sourcing activities, USS intermediaries rely mostly on pricing in procurement. They provide price information that they source to their supplier via buying prices. Their suppliers rely on this information to decide whether they remain competitive. USS pricing is the most transparent of the main three rubber products. There are three main auction markets in the south of Thailand that provide marketing, sourcing and information services. The latter service contributes to the NR community as a whole because it is used for benchmark prices. Some of the USS processors even set the buying prices relative to the auction price in particular markets. In addition to the physical prices, futures prices from both domestic and international exchange markets also play a role in price formation. Mostly, NR trading in futures markets is centred on RSS3 grade NR, which is a derivative of USS. Therefore, it is not difficult to reference the USS price from these markets. The transparency in price information is one of the key factors that made the USS supply chain become the most competitive and complex of the NR supply chains.

Regarding processing time in USS trading, it can be resold if necessary, immediately after buying without a processing requirement. It can also be held in stock for some time for delivery or speculative purposes. However, grading is the value-added process in USS supply chains. Even though rubber sheet products are dried, they still contain a low level of water and waste. USS intermediaries are likely to grade the product they bought to supply different markets in order to make more profit.

An outbound logistics service in USS supply chains is a key competency of NR businesses. The higher volume of product transportation results in a lower cost per kilo. Additionally, the locations of intermediary businesses are typically situated in NR producing areas. Thus, the intermediaries' outbound logistics service is one of the key conditions to make NR supply chains efficient.

USS intermediaries not only provide outbound logistics service but some also include an inbound logistics service in their business in order to retain market share and add value to the business. RBI11 commented: *(APPX_S_404).*

USS businesses provide financial services by exchanging USS products and cash. Even though they can make the payment by transferring via banks in the case of a high volume trade, farmers and small USS intermediaries are commonly paid in cash.

Marketing is at the heart of USS intermediary businesses as this market is the most open relative to other types of NR markets. Therefore, the profit margins of USS intermediaries are relatively low since the market is highly competitive. For example: *(APPX_S_405).*

Selecting the right market channels and trading strategies is a complex task; it decides how much profit is made. More details of this topic are in Chapter Six.

USS intermediaries also play an important role in balancing demand and supply in the chain. Although NR trees can produce latex throughout the year, the latex volume they produce varies relative to the season or weather. Furthermore, the demand from the NR industry mostly depends on the economic situation. Therefore, producing NR to meet demand is a challenging task. The USS intermediaries provide this service by buying and holding stock during low demand period and reselling it when demand is recovering. One USS intermediary expressed that: *(APPX_S_406).*

4.3 Latex Intermediaries

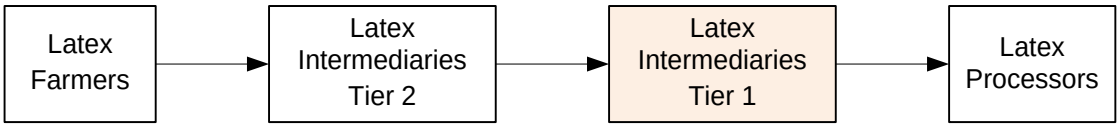


Figure 4.3: Latex intermediaries' supply chain derived from this research

Latex intermediaries were introduced into NR supply chains in recent years as the demand grew mainly for products made from dipped goods, such as medical groves and condoms. The southern provinces, where their locations close to Malaysia are where the majority of concentrated latex is exported to, are amongst the first areas changing from USS to latex supply chains. Latex intermediaries, who are considered to be Tier 1, are the collecting points and distribute their buying latex to latex processors, as presented in Figure 4.3, (mostly within a day of buying because of latex deterioration concerns). The Tier 1 latex intermediaries buy latex mainly from smaller latex intermediaries who collect daily the small amounts of field latex from farmers. The small volume and diverse chemical properties of field latex that farmers produce prevents the Tier 1 latex intermediaries from buying latex directly from the farmers. Therefore, they depend heavily on Tier 2 latex intermediaries.

In terms of the factors impacting latex supply chains, volume is a predominant factor as its grading method is the most reliable amongst the three rubber product supply chains:

USS, latex and cup lump. Tier 1 latex intermediaries depend heavily on the supply of Tier 2 latex intermediaries. As a consequence, these supply chains are highly competitive in their daily pricing as volume is the key factor to gain competency and the marketing power in a logistics service in negotiation with latex processors.

Unlike in USS supply chains, where there is an alternative way to source via auction markets, latex sourcing depends solely on latex intermediaries (see Figure 4.2). Even though there is the Hat Yai auction market that provides latex sourcing, it is very low volume relative to the whole market and just for the latex from the local area. This service is provided on a daily basis due to the short life cycle of field latex. This vulnerable property of field latex makes the latex supply chain structure simple: building up the volume of products and then selling to the next supply chain players. Buying and selling carried out on a daily basis results in some level of limitation of the services that can be provided. Therefore, the relationships between counterparties in trading plays a vital role in this supply chain, which in turn creates the importance of the sourcing role of intermediaries in the supply chain.

Latex can be easily transformed into other NR products, such as USS and RSS. Therefore, sourcing is competitive. However, there is a small window price gap that can be negotiated compared to the benchmark price announced by the TLA. Two of the latex RBIs commented that: *(APPX_S_407).*

With regard to the processing time in latex trading, daily trading is the norm in latex supply chains as they are vulnerable. Latex intermediaries are responsive for preserving the latex they buy by adding an appropriate volume of ammonia. Additionally, for transport or speculative reasons, it can be preserved for a day. However, the preservation of latex is not an easy task. The mixing of latex from different sources with a variety in quality may result in a lower quality overall if some of them are low quality. Therefore, they may receive a low price leading to huge losses because of the high volume in trading. One of the latex intermediaries mentioned: *(APPX_S_408).*

Grading in latex supply chains is rather precise as it uses a scientific method, but it is considered expensive if it is used for a low volume of latex. Therefore, the compromise in the grading system commonly taking place may result in a loss when reselling to latex processors. RBI04 explained that: *(APPX_S_409).* However, when considering the high volume of product in which they trade, this small price gap may equate to a lot of money. Therefore, it is necessary for intermediaries to keep negotiating the price from processors and informing their suppliers to make sure they get the right price.

The logistics role in a latex supply chain is very important. Latex rubber intermediaries are sometimes considered as latex logistics providers rather than traders. Their business locations are the collection points linking to small latex traders. Because their trading and logistics activities are taken more often than those of other NR supply chains, the efficiency of logistics in business is likely to drive the business supply chain structure.

The short life cycle of latex businesses on a daily basis results in the requirement of a low cash flow. Therefore, lending money to suppliers to run their businesses is not unusual in latex supply chains due to the high integration of the chain. This financial service brings about the benefit of maintaining, or even expanding, their supply.

Moreover, the intermediaries also provide price information amongst processors. Supply information is essential to processors as the intermittent production can be dependent on weather and alternative product prices. The short life of field latex before processing leads to the integration of the supply chain, which in turn leads to the exchanging of information amongst members. The limitation of processing and warehouse capacity that the processors set up to manage the uncertainty of latex production leads to the need of supply information to meet their operational plan and to help them not produce beyond capacity.

Since the nature of the latex business is in daily trading due to the limitation of field latex preservation technology, latex intermediaries mostly use natural hedging by applying back-to-back selling. Therefore, PRM strategies are less important when compared with the other NR supply chains. However, there are some price risks when the prices fluctuate. Due to the nature of the business, sourcing pricing happens in the early morning, while selling prices are formally informed in the late morning. One of latex intermediaries said: *(APPX_S_410).*

Therefore, they are exposed to some level of a price risk. Even though, the level of risk is considered small, its effect is likely to be large in regards to the high volume they regularly trade.

4.4 Cup Lump Intermediaries

Cup lump was originally the byproduct of a USS making process. There are three main sources of cup lump during this process. After tapping by farmers to extract the latex from rubber trees, some latex coagulates into cup lump. After collecting field latex, some rubber trees still keep producing latex and during the process of producing USS, some of it becomes waste. In recent years, the demand of rubber block has increased, which led

to some farmers producing cup lump as their main product in order to supply block rubber factories.

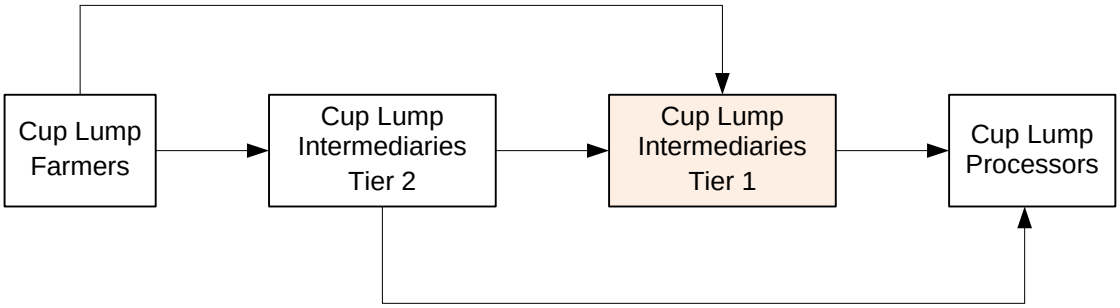


Figure 4.4: Cup lump intermediaries' supply chain resulted from the research

As cup lump contains some waste and water, the measurement of the net weight of rubber is not easy. In current practice, it has been mainly graded by sight, compared with grading using a scientific method in latex supply chains. Since there is a lower level of precision for the measurement of the net weight in cup lump supply chains than that of latex, the supply chain of cup lump seems more complex as some smaller cup lump intermediaries have an alternative marketing choice to sell their products directly to cup lump processors. Therefore, although the volume plays an important role in cup lump supply chains, the uncertainty of the grading method is also important.

Sourcing in cup lump supply chains is similar to that of latex supply chains, i.e. building up the volume of the product and then reselling to the next supply chain player. Nonetheless, the high level of variety in the product's quality plays an important role in this supply chain, including in sourcing. Grading by sight on the net weight of the product gives rise to the importance of negotiation power, which usually depends upon the volume that is being traded.

To have competency in the cup lump supply chain, the intermediaries have to know the grading systems of each processor and process the product to meet the criteria. However, unlike latex, which is traded on a daily basis, cup lump can be stocked for a period of time depending on the warehouse and the grading system of the processors that they sell to. Therefore, the small intermediaries can sell the products directly to processors (as seen in Figure 4.4), although they may have a lower negotiation power to maintain the level of grading system considered vital in cup lump supply chains.

The processing time in cup lump businesses varies between different grades of products. Due to the contamination of waste and water in the product, it depends greatly

on the expertise in product grading and processors' requirements of cup lump intermediaries. These lead to the different times in processing so the product can meet the particular requirement, in order to maximise profits. Nonetheless, stocked cup lump is exposed to a weight-losing risk from water dehydration. With a suitable warehouse and the intermediaries' expertise it can be stocked for speculation if they so wish.

Grading in cup lump supply chains is a challenging job as the variety of cup lump affects how the intermediaries have to maintain their competitiveness and still make profits. Not only do they have to grade cup lump products when they buy from their suppliers effectively, but they also have to know it approximately when they sell to processors. With the high volume in which they trade, a little variance in grading means a huge change to profits or losses. This leads to the importance of marketing power in negotiation with processors.

The low cost of outbound logistics, due to economies of scale in transport, plays a role in cup lump supply chains, but the volume of the product is also linked to the grading systems that are dominant in cup lump industries. The bigger the transport vehicles are, the less water is left in cup lump products, which in turn leads to a more precise grading measure. This tends to be beneficial to the big intermediaries in getting fairer prices than smaller ones. One of cup lump intermediaries said: *(APPX_S_411).*

Additionally, as cup lump producers usually sell the product periodically, they tend to trade in a high volume. Therefore, it is important to provide inbound logistics to gain an advantage over competitors. He added that: *(APPX_S_412).*

Buying cup lump from farmers at raw product prices and selling it at net prices to processors, accounting for the contaminant estimation, is a challenging task for cup lump intermediaries. Because cup lump is traded at the raw product prices, the highest price the processors provide may not always maximise the profit they make. This is because the setting price of processors is on a net price basis. Therefore, the intermediaries have the responsibility to recalculate to the price of a raw material by combining the given net price with a particular processor's grading system. However, the intermediaries have to take some level of risk as they use the sight grading system to make the process of their business simpler.

Unlike latex, cup lump can be stocked to meet processors' longer-term production plans. Therefore, the requirement of supply information from cup lump intermediaries is less important. Therefore, marketing strategies in PRM or speculation strategies are

important to cup lump intermediaries. Some of PRM strategies currently used are in Chapter Six.

4.5 Latex-RSS Intermediaries

Not only do RBIs play a role in maintaining the balance of supply to meet demand in NR supply chains, but in some occasions they also help the chains to produce a particular type of NR products to meet specific requirements. Latex-RSS intermediaries are the processors that transform latex into RSS rubber grade. The lower costs of processing per unit due to economies of scale make the supply chains more efficient. As a consequence, this is another benefit that RBIs contribute to NR industries.

Latex-RSS intermediaries rely on the value added in the process of transforming latex into RSS. Their profit margins depend on the differences between latex and RSS prices, minus production costs. Since the nature of their business needs latex as a raw material, they may be considered as competitors of latex intermediaries. The costs of producing RSS from latex range from five to seven Baht per a kilo and the process will take between three and four days. This means that they will make profits when the price difference between latex and RSS is above their costs. Otherwise, they may decide to sell all or some of their field latex to latex processors to avoid the risk of a loss. RBI22 explained: *(APPX_S_413).*

In terms of sourcing, Latex-RSS intermediaries share the market with latex intermediaries. Even though field latex is the major form that farmers produce, the Latex-RSS intermediaries have to be competitive in pricing relative to concentrated markets. As a result, sourcing costs usually depend on latex markets regardless of the costs of processing and the risks of RSS selling prices. One Latex-RSS intermediary expressed that: *(APPX_S_414).*

The marketing options of RSS are less flexible than USS as it is the exporting grade. There are four choices available: selling to RSS processors; selling to auction markets; selling to the ORRAF; and, more recently, signing week forward contracts with limited quota (see Figure 4.5). Moreover, their business is considered to be an NR stockholder that could sustain severe damages when RSS prices go down. One of the Latex-RSS intermediaries said about the limit of his marketing that: *(APPX_S_415).*

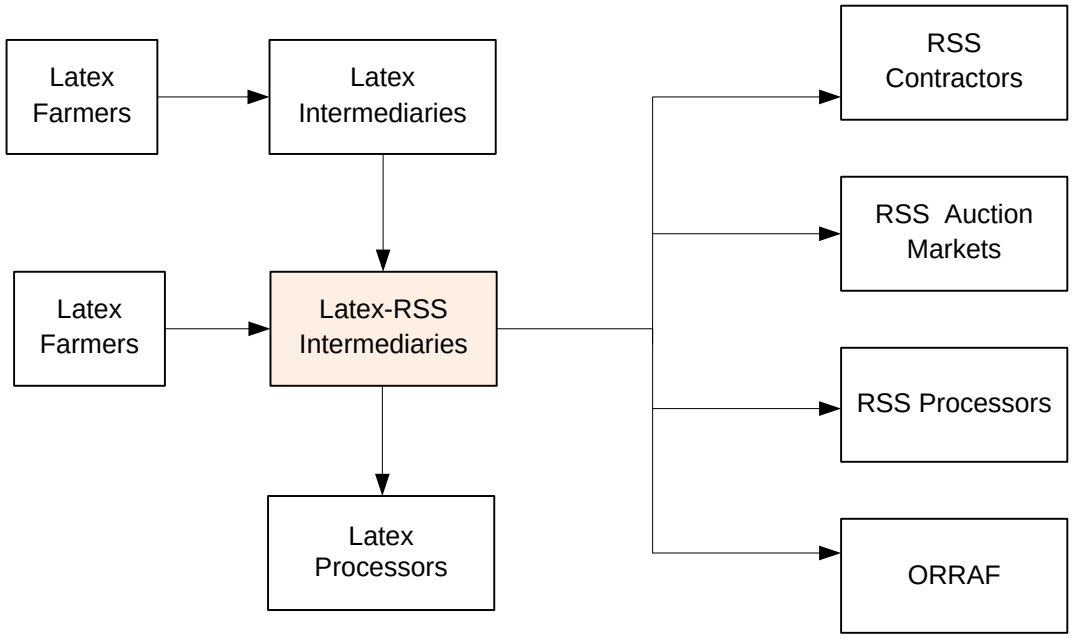


Figure 4.5: Latex-RSS intermediaries' supply chain derived from this research

Therefore, sufficient available choices in PRM instruments are essential for Latex-RSS intermediaries' business. How Latex-RSS intermediaries utilise the limited options of marketing in order to deal with price risk is in Chapter Six.

4.6 Latex-USS Intermediaries

Sourcing raw materials from latex markets and then processing and selling what they produce to USS markets are the characteristics of Latex-USS intermediaries' business. Latex-USS intermediaries are the latex processor similar to Latex-RSS intermediaries, but they are drying the rubber sheet that they produce rather than smoking them. This leads to lower costs of production, which are approximately three Baht per a kilo, but take longer to finish the product (around ten days). Therefore, the bottom line of their business depends mainly on the costs of latex and processing, and the price of USS.

With regards to sourcing, like Latex-RSS supply chains there are two different sourcing channels available for Latex-USS processors: directly from farmers; and from latex intermediaries, as illustrated in Figure 4.6. Since the profit of their business relies upon the price difference between latex and USS, in the profitable periods they can escalate production by sourcing from the latter channels. Moreover, Latex-USS processes are easier to expand when compared to Latex-RSS because there are a fewer processing steps. It is clearly seen that competition in latex markets is unavoidable.

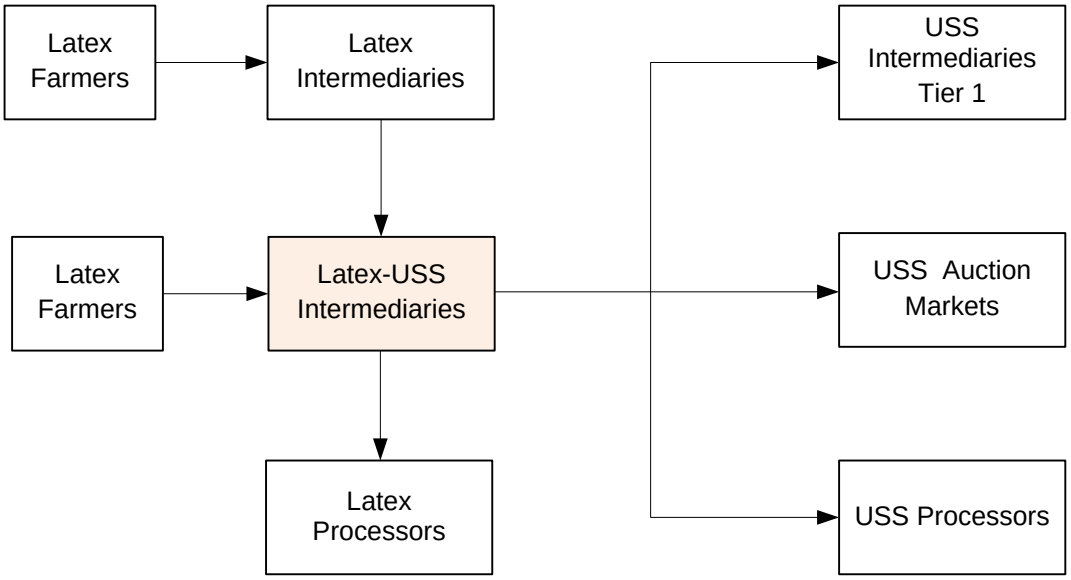


Figure 4.6: Latex-USS intermediaries' supply chain emerged from the research

Considering the marketing channels they have, there have more options than RSS. Latex-USS intermediaries can select marketing channels, as shown in Figure 4.6, like USS intermediaries. Although Latex-USS intermediaries seem to have more advantages than Latex-RSS intermediaries in terms of lower producing costs and more flexibility in marketing, USS prices are likely to lower than those of RSS and Latex-USS processing time takes longer than that of Latex-RSS. During a volatile market, it seems that the longer the time they take can lead to the higher price risk that they are exposed to. Nevertheless, they can compensate with hedging or marketing strategies that are available to them. RBI16, a Latex-USS intermediary, expressed that: *(APPX_S_416).*

Therefore, PRM strategies are vital in Latex-USS supply chains as they are the key competency of the business. The more details of the PRM strategies in the Latex-USS supply chain are in Chapter Six.

4.7 Chapter Summary

Regarding NR products, supply chain structures and providing services, RBIs can be classified into five groups: USS, latex, cup lump RBIs all buy and resell the NR products as the name suggests. Latex-RSS and Latex-USS RBIs are latex processors into RSS and USS, respectively. The different business characteristics of RBI types are shown in Table 4.1. Doing business as RBIs, NR product characteristics play an important role in trading. The trading process and stocking ability form the way to manage their business. USS is the NR product that has the most storability, and the grading system is reliable

even though it is graded by sight. Hence, USS trading depends mostly on speculative ability.

Latex, on the other hand, is less storable but uses a scientific method in grading, a more reliable grading method relative to those used for cup lump, USS and RSS. The lower storability of latex leads to it being the most frequently traded product, which means a close relationship within the chain. However, the latex market is sensitive in its prices as its grading system is precise. Moreover, latex supply chains have to compete with the latex-processor chain, i.e. Latex-RSS and Latex-USS. This results in the market being highly competitive.

Cup lump is more storable than latex, but less than USS. Nevertheless, its grading system depends highly on the judgement of its graders by their sight. Therefore, cup lump RBIs rely partly on the relationship or market power to processors to maintain their competency in the business. Furthermore, cup lump RBIs have some ability to speculate from stocking and forward contracts like USS.

Buying product in the latex market and then processing it and turning it into a RSS product is the main activity in a Latex-RSS intermediary business. The business adds value to the latex. However, it is not always the case since sometimes latex prices are above RSS prices after producing costs; sometimes latex prices are even higher than RSS prices. Additionally, there are fewer selling market channels for RSS than for USS.

Latex-USS intermediaries are NR processors, similar to Latex-USS, but the end product is USS. The processing takes longer than for Latex-RSS, but has lower costs of production. Regarding USS markets, it is the most wildly open relative to the other products. As a consequence, beside the value added to the latex, PRM is considered as a key success in a Latex-USS business.

In addition to RBI types and their business characteristics as summarised in Table 4.1, the following chapter demonstrates the research findings with regard to NR market transformation, price formation and price risk implications.

Table 4.1: RBI business characteristics

RBI Type	Business Characteristics
USS	• Longest storability relative other primary NR products • Flexibility on marketing decisions: either hedging or taking price risk • The most independent supply chain structure • The most speculative NR product • The main raw material for producing and exporting NR grades of RSS and block rubber • Making profit mostly from speculation • Sensitive to price volatility
Latex	• Shortest life cycle (mostly trading in a day) • Being sold immediately • Profit made from collecting points and logistics providers • Closest supply chain relationship • Compete for latex sourcing with Latex-RSS and -USS processors • Main material for producing concentrated latex, RSS and some grades of rubber block • Risks from sourcing prices and latex deterioration
Cup lump	• Stocking time longer than latex but shorter than USS • Trading prices depending highly on grades (mostly drying process-dependent) • Need good supply chain relationship to monitor the grading system • The main material for rubber block • Profits made from providing collecting point and transport services and speculation • Risks from price volatility, grading system and losing weight from stocking
Latex-RSS	• Processing latex into NR product form ready to be packaged and exported • Processing time – 4 days • Processing costs – 4-7 Baht/kg • Easiest to be graded • Productions cost mainly from latex costs • RSS is the main NR grade traded in futures markets • Profit made from a value added process • Risks from price volatility and the price basis of latex and RSS

Table 4.1: RBI business characteristics (cont.)

RBI Type	Business Characteristics
Latex-USS	• Processing latex into the NR product form, which is easy to market • Processing time – 10 days • Processing costs – 3 Baht/kg • Flexibility in marketing (RRM available like for USS) • Like Latex-RSS, production costs mainly from latex prices • Profit made from a value added process like Latex-RSS, and speculation like USS • Risks like those of Latex-RSS, but higher a level of price risk as it requires a longer time to process (however, it can be compensated by the availability of PRM tools)

Chapter 5 NR Market Transformation, Price Formation and Price Risk Implications

5.1 Introduction

This chapter outlines the NR market transformation and price risk causes from RBIs' perspectives. Moreover, it sets out the factors and stakeholders that influence NR price movements. Following on, it considers the implications of NR price risk on five types of RBIs. These are: USS, cup lump, latex, Latex-RSS and Latex-USS. This chapter outline is as shown in Figure 5.1.

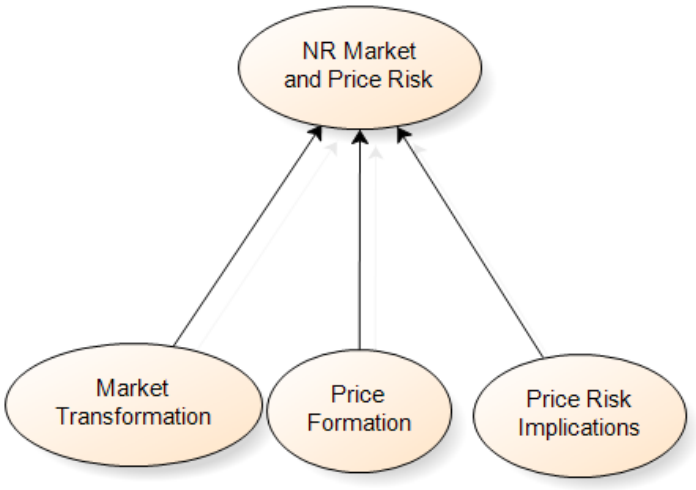


Figure 5.1: The final template of NR market and price risk

NR market transformation in relation to NR market changes and its potential sources are dealt with in Section 5.2. Section 5.3 provides NR price formation in relation to price movement factors and players. Then, the price risk implications on rubber intermediary businesses are identified in Section 5.4. Similar to those in Chapter Four, quotations from interview transcripts from 24 research participants in Sections 5.2, 5.3 and 5.4 are available in Appendix T as indicated in the text. A summary of the chapter is provided in Section 5.5.

5.2 NR Market Transformation

As shown in the final template of NR market transformation and its causes in Figure 5.2, this section demonstrates how an NR market has been transformed in RBIs' views. Subsequently, the sources of price risk toward RBIs' business are also clarified.

5.2.1 NR Market Changes

There are several aspects of NR market have been changed, as illustrated in Figure 5.3. One of them is that price movements are changed quickly like financial stock prices. RBI24 described that: *(please refer to APPX_T_501 in Appendix T).*

Another RBI stated that analysis of NR price has become more complicated *(APPX_T_502).*

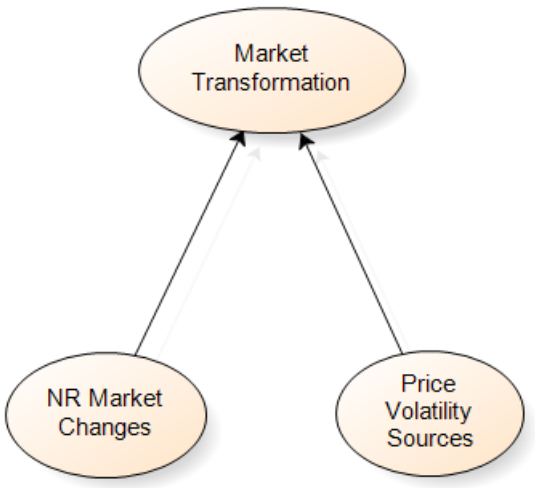


Figure 5.2: The final template of NR market transformation

NR, crude oil and gold price correlation has changed. While crude oil and gold prices used to be the price movement indicator of NR, nowadays they cannot be used effectively *(APPX_T_503)*.

Another change that has taken place in recent years is AFET. Its efficiency was acceptable when it was first introduced. At present though, its usefulness for hedging is on the decline. An RBI who realised the potential benefits of AFET mentioned that: *(APPX_T_504).*

The relationship between RBIs and NR farmers has changed. RBIs felt that farmers relied less upon their information, which made it more difficult to deal with them. Instead, farmers have alternative sources of information, not least of which is from advanced technology. RBI12 revealed: (APPX_T_505).

Even though, RBIs depend upon price volatility to generate profits, too great a volatility puts them over the limit of management capability. One of them expressed that: (APPX_T_506).

Price volatility has been increasing in recent years. One RBI believes that it was the consequence of emerging technology, including the internet and devices for accessing it (APPX_T_507).

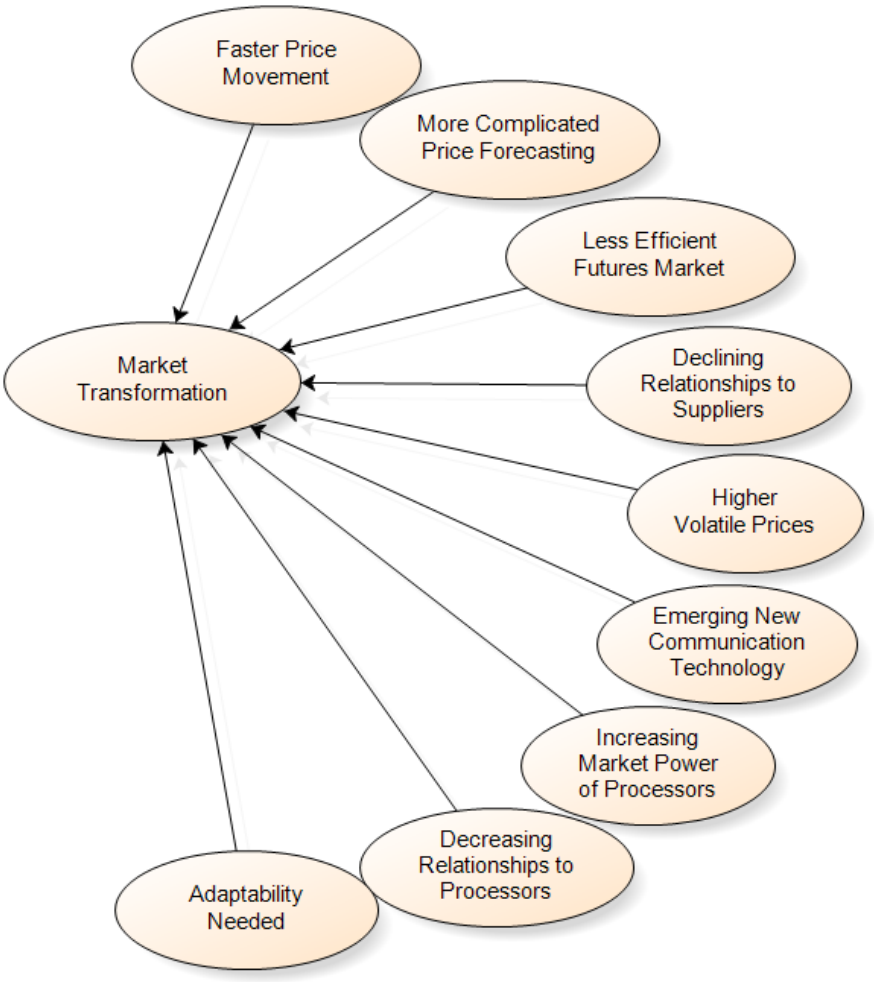


Figure 5.3: The final template of factors influencing NR market transformation

Rather than prices being influenced by just demand and supply, the increasing market power of processors now affects price formation. In fact, they are now the greatest influence on decisions. For example: *(APPX_T_508).*

The relationship between RBIs and processors has become increasingly weaker. In the past, they relied upon each other in sourcing and marketing. RBI11 commented: *(APPX_T_509).*

RBI09 suggested that to survive in this changing environment, RBIs have to be adaptable *(APPX_T_510).*

5.2.2 NR Price Risk Sources

It is clearly seen that NR price has fluctuated more in recent years and this section investigates its causes, from the perspective of RBIs. Introducing of futures markets, market competition, financial markets, global advanced communication technology, the China factor and excessive speculation are identified as the causes by RBIs (as illustrated in Figure 5.4).

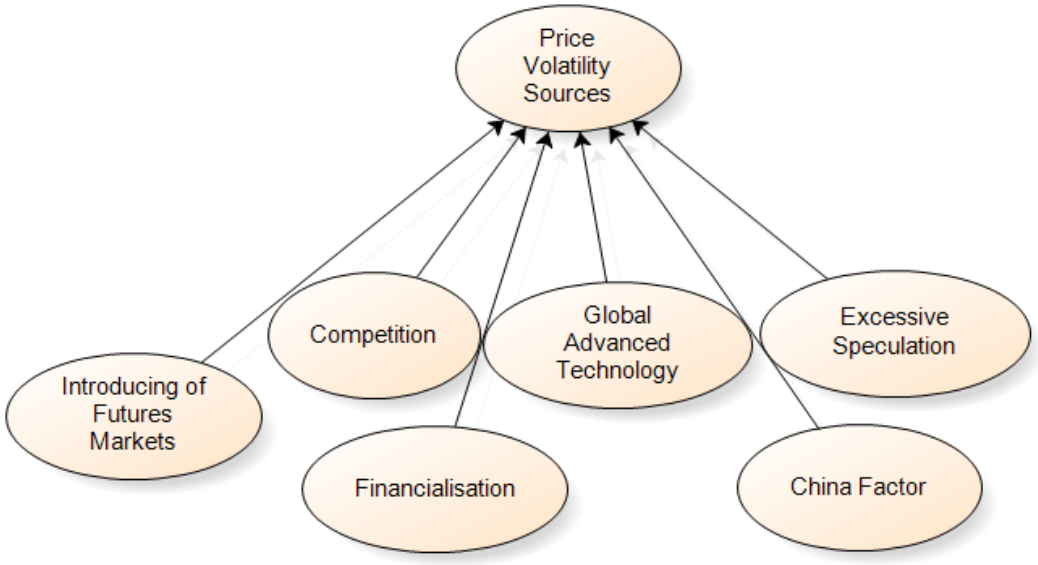


Figure 5.4: The final template of NR prices volatility sources

It was the introduction of the futures market that made price become more volatile. Prices in the futures market were used in physical trading. Therefore, the fluctuation of prices in futures markets led to the fluctuation of those in physical trading *(APPX_T_511)*.

Competition is one of the main factors that forced RBIs to be exposed to more price risk. This is because competitions made RBIs gain even less of a margin, or even make a loss, when they bought NR product from farmers. One of RBIs expressed: *(APPX_T_512).*

NR markets are now characterised by financialisation, which occurs when financial markets are linked together. As a consequence, NR market price behaves like the stock markets. RBI18 commented: *(APPX_T_513).*

Global advanced technology now links the world together, which means that more traders are able to access to the NR futures market. This makes NR price more sensitive to information, which is relevant to price movement factors *(APPX_T_514)*.

In previous years, China became the biggest NR importer. Some processors experienced contract defaults from Chinese customers, which in turn lead to NR market price collapse. One RBI, who also acts as an exporter, revealed that: *(APPX_T_515).*

As NR was traded in the futures market, speculators were easily able to trade it. They could make profits from both price movement directions. RBIs believed that they caused price fluctuations. RBI13 explained: *(APPX_T_516).*

5.3 NR Price Formation

This section presents NR price formation from the RBI's perspective. It is illustrated by both from relevant factors and market players, as shown in Figure 5.5 below.

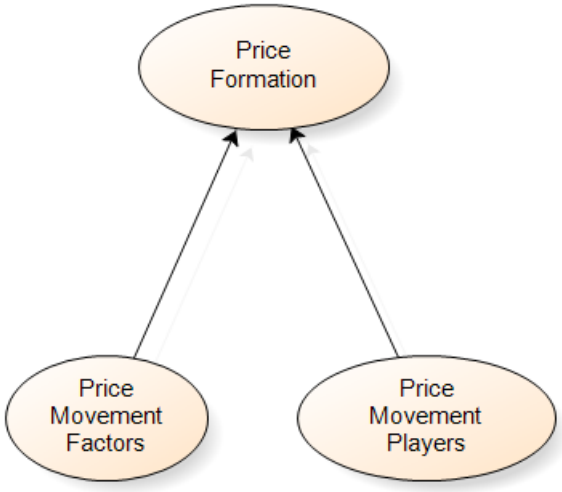


Figure 5.5: The final template of NR price formation

5.3.1 Price Movement Factors

There are several factors RBIs believe have an impact upon NR prices, as shown in Figure 5.6. Amongst them are factors relevant to the world economy: stock markets, economic news and commodities prices. These factors are included in NR price movement speculation by RBIs. RBI18 explained: *(APPX_T_517).*

RBI21 similarly stated that: *(APPX_T_518).*

Some RBIs divide the factors into short- and long-term impact on price movement so that they can form the trading plan suitable for their resource. The price movements affect their sourcing costs, as well as the opportunity to sell their NR products. Therefore, they have to prepare a second plan to deal with the unexpected situation, as prices are difficult to forecast in the long term: *(APPX_T_519).*

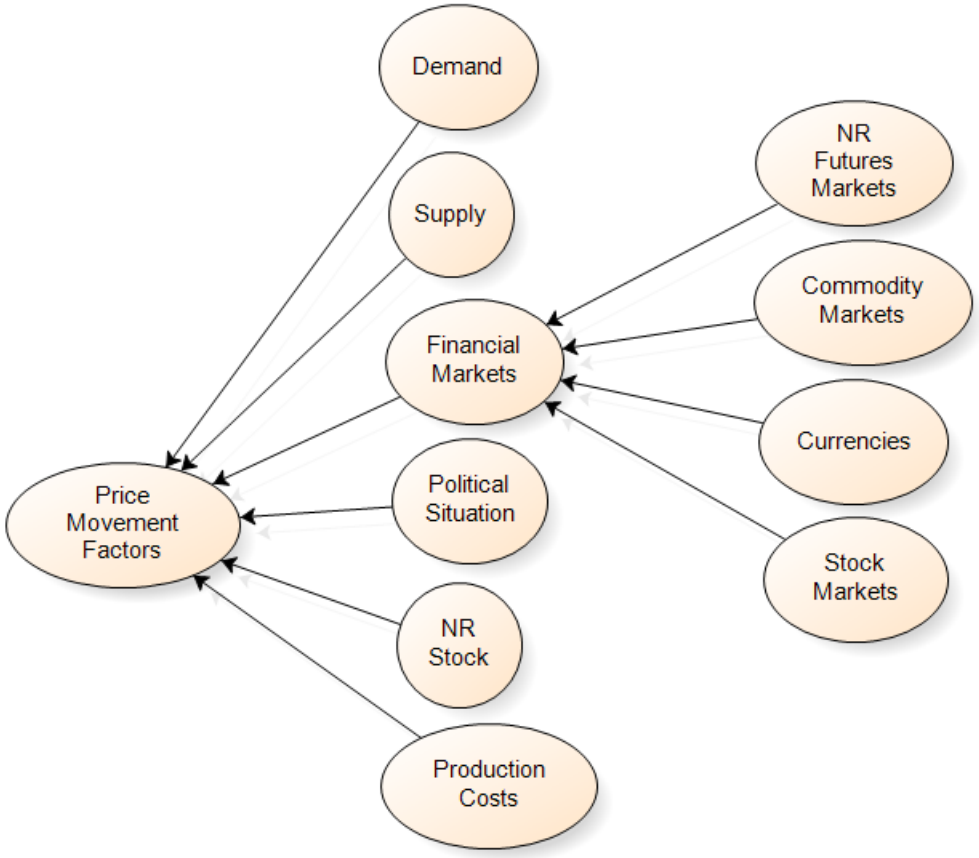


Figure 5.6: The final template of price movement factors

One RBI revealed that the price in the short-term depends upon the supply and demand of processors, rather than that of the world market: *(APPX_T_520).*

RBIs rely upon price information from their business partner news and technical graphs to predict prices in the short-term horizon: *(APPX_T_521).*

Although future market prices—particularly in TOCOM—are popular as price predictors, sometimes their prices and the physical market do not move together. This is due to the conflict between demand of the domestic and world markets. RBI20 explained: *(APPX_T_522).*

There are six main factors influencing NR price movements. They are demand, supply, the financial market, the political situation, NR stocks and NR production costs, as shown in Figure 5.6. The details of each factor are as follows.

5.3.1.1 *Demand*

Actual demand of NR is difficult to know. To speculate it, RBIs use the world economy as an indicator reflecting the demand. One of them mentioned that: *(APPX_T_523).*

NR is a commodity that has real demand and supply from physical markets. Even though it has been traded in a future market, it is not easily manipulated without fundamental demand and supply support. RBI20 added that: *(APPX_T_524).*

Some RBIs believe that prices of NR reflect the balance of its demand and supply. One RBI explains how NR prices are formed: *(APPX_T_525).*

The reason why the world economy represents the demand for NR is that it reflects the buying power of consumer countries. The majority of NR products are used in the automobile industry, especially for tyres. One RBI explains how he speculates the NR price: *(APPX_T_526).*

Except from the world economy, order placement is a key factor that RBIs consider as important to demand. The orders have a high influence in domestic demand as processors are likely to offer premium-buying prices to RBIs. RBI12 expressed that: *(APPX_T_527).*

5.3.1.2 *Supply*

NR supply is a factor that RBIs are expertise in. Their role is to work closely with farmers who are their suppliers. As Thailand produces almost one third of the NR world supply, the changes in NR supply can affect that of the world. The following factors are involved in NR supply.

Although NR can produce latex over the year, its production fluctuates over time. There is low production in dry and rainy periods. Therefore, both season and weather affect NR production *(APPX_T_528)*.

5.3.1.3 *Financial Markets*

Financial markets have an impact upon NR prices in the immediate term. Therefore, they are important information sources to RBIs in making their daily decisions relevant to prices. One experienced RBI explained how he follows the market information that is involved in NR trading: *(APPX_T_529).*

However, trading relationships within the financial market are complex. Their relationship has changed over time. For example: *(APPX_T_530).*

- **NR Futures Markets**

At the heart of NR trading, NR futures markets play the most vital role in NR prices. In daily trading, RBIs study a variety of different NR futures markets that open in different time zones. RBI22 explained how he uses them during the day of NR trading *(APPX_T_531)*.

TOCOM prices are used wildly by NR traders. Apart from RBIs, processors reference TOCOM as well: *(APPX_T_532).*

RBIs use the price in SICOM to represent the current price rather than that of the future. Therefore, they use it as a daily decision for basics like pricing for buying or selling: *(APPX_T_533).*

- **Stock Markets**

To understand the world economy, the major stock markets around the world are used by RBIs to predict the NR price. They are Dow Jones, Nikkei, Shanghai Composite, Hong Seng and European stock markets. RBI09 explained that: *(APPX_T_534).*

- **Other Commodity Markets**

NR prices are also relevant to other commodity prices. Amongst traded commodities, two of the commodities that are well known for RBIs are crude oil and gold prices. One RBI mentioned that he studies the prices of gold and crude oil in order to speculate on NR prices: *(APPX_T_535).*

Crude Oil

Crude oil prices influence NR price but only for certain periods. Although crude oil prices are used widely by RBIs to reflect NR price, the price forecasting's effectiveness varies over time. Their movements are not correlated all the time. For example: *(APPX_T_536).*

RBI05 explained why crude oil prices affect NR price. This is because synthesis rubber (SR) can substitute for NR at some levels and SR is made from crude oil: *(APPX_T_537)*

Gold

Gold prices influence NR prices but not always. One of the RBIs explained: *(APPX_T_538).*

- **Currencies**

There are two ways that currencies affect NR price. Firstly, the main NR market of Thailand NR products is the export market. Moreover, the main futures exchange markets are traded in foreign currency. Therefore, the changes in currency exchange rates have direct effects upon NR prices. Secondly, as price movements in the futures market result in physical prices, the flow of speculators' capital amongst stocks, currency and commodities are another way to explain the relationship between currency and NR prices *(APPX_T_539)*.

RBI06 explained why the Thai Baht exchange rate impacts upon NR prices: *(APPX_T_540).*

The volatility of the exchange rate also has an effect on NR prices. RBI09 revealed that: *(APPX_T_541).*

5.3.1.4 *Political Situation*

It is believed that the instability of politics may lead to unfair trade. The powerful players may see an opportunity to gain an advantage over the weaker market stakeholders. One of the RBIs speculated that: *(APPX_T_542).*

Some RBIs have even experienced market collapse from certain political events. One RBI stated that NR price is sensitive to unexpected political events, usually in a negative way: *(APPX_T_543).*

5.3.1.5 *NR Stock*

Some RBIs believe that NR stock held by the Thai government has a negative impact on price rising. They are reluctant to hold NR stock as the government might sell the stock and the price would plummet. RBI23 mentioned that: *(APPX_T_544).*

5.3.1.6 *NR Production Costs*

The production costs impact on NR supplies, resulting in fluctuating prices. Some farmers may stop producing or stocking the produce if prices are too low, particularly if the prices are lower than production costs. Some cannot stop production, since they need a regular income for spending. RBI20 commented: *(APPX_T_545).*

In addition to farmers who stock NR when its price is too low relative to production costs, RBIs will do the same. This stocking behaviour may influence the price to increase: *(APPX_T_546).*

5.3.2 Price Movement Players

This section reveals the influence of the NR supply chain player on price movements. There are seven types of the players being discussed: speculation, hedge funds, NR users, processors, RBIs, politicians and NR farmers (for more details of these see Appendix U).

5.4 Price Risk Implications

A common tool as a price-movement indicator in order to make decisions in daily trading for five RBI types is the price in the TOCOM market (for more details see Section 6.5.3.1). Therefore, RBIs were faced with a similar price volatility. It is interesting to note that the implications of any price movements were different, even amongst the same kind of RBIs. This was a consequence in terms of the differences in the time of their business cycles and levels of ease in product marketing or price risk hedging. For instance, Latex-USS intermediaries may spend ten days processing latex into USS before the USS product could be sold, while latex intermediaries commonly trade their products within a day. The following sections are dedicated to the impact of NR price risks on different RBI types, as shown in Figure 5.7.

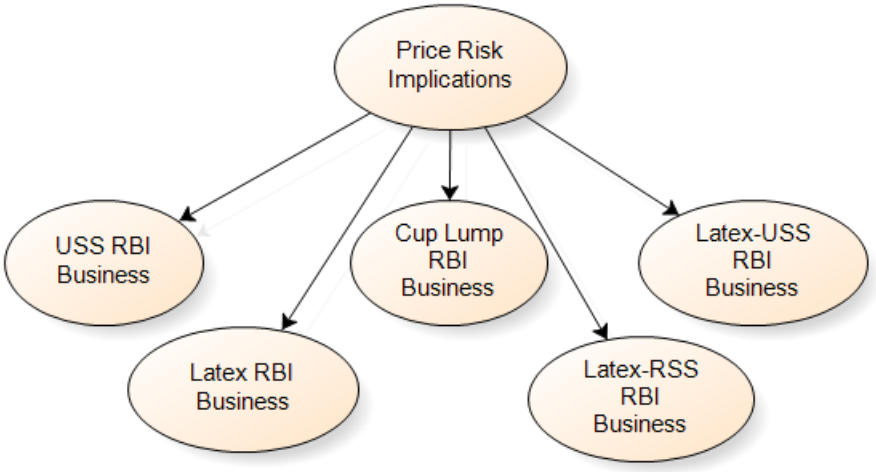


Figure 5.7: The final template of price risk implications

5.4.1 USS Business Intermediaries

There is a mixed level of price risk impacts amongst USS RBIs. One of the USS RBIs who seems to be successful in dealing with price volatility expressed the view that: *(APPX_T_547).*

Another USS RBI supported the above statement and supplemented it by saying that price movements have to be based upon fundamental factors *(APPX_T_548)*.

RBI21 agreed that RBIs have to rely on price volatility, but argued that too much volatility might lead to the dysfunction of available PRM instruments. He recalled that: *(APPX_T_549).*

He also experienced a situation in which the price plummeted and he held NR product stock at a processor's warehouse *(APPX_T_550)*.

On the other hand, a USS RBI who had suffered from price fluctuations commented: *(APPX_T_551).*

5.4.2 Latex Business Intermediaries

Latex has a shortest business cycle amongst five types of NR business. It is considered as a daily trading business. As a consequence, it has a tendency to be exposed to less price risks. PRM is rarely needed in this business. RBI02 said: *(APPX_T_552).*

However, another latex RBI added that the market competition might force her to take a price risk by buying at a high price which might then turn the transaction into a loss *(APPX_T_553)*.

5.4.3 Cup Lump Business Intermediaries

Like the USS business, cup lump intermediaries' business also relies on price movements. Consequently, cup lump trading also has a significant impact from price volatility. One of the cup lump RBIs stated that: *(APPX_T_554).* Moreover, as the cup lump grading system is by graders' sight, it is not reliable as a scientific method in the latex industry,

Another cup lump RBI explained that if price movements are at low levels, it may attract new competitors into the market *(APPX_T_555)*.

5.4.4 Latex-RSS Business Intermediaries

Unlike USS and latex RBIs, Latex-RSS require a lead time in processing before they can market it as the RSS product. Therefore, price movements in this period directly impact upon their business performance in terms of gains or losses. One Latex-RSS RBI stated: *(APPX_T_556).*

Latex-RSS RBIs were not exposed to only the price movement of a single product, but two different products - latex and RSS. Therefore, they are exposed to both price risk and price basis risk between them. For example: *(APPX_T_557).*

It is unsurprising that Latex-RSS RBIs are negatively affected by previous price volatile periods. Another Latex-RSS RBIs commented: *(APPX_T_558).*

5.4.5 Latex-USS Business Intermediaries

Similar to Latex-RSS intermediaries, Latex-USS RBIs were exposed to the price movements of two NR products. These are latex and USS. However, Latex-USS RBIs have a longer business cycle time than that of the Latex-RSS RBIs. They tend to be exposed to a higher possibility of price changes. This may be compensated for with the ease of USS product marketing. A Latex-USS RBI commented: *(APPX_T_559).*

5.5 Chapter Summary

The NR markets have changed in several aspects in recent years. Prices were more volatile and more difficult to be forecasted. As a consequence, the relationship between NR supply chain players changed to become wider, especially between RBIs and NR processors, and between RBIs and NR farmers. Despite this, RBIs depends upon the volatility of price to generate profits, and therefore they are likely to suffer from high price volatility. They are unable to manage their business effectively during such periods of high price volatility.

There are various factors that RBIs believe to be the sources of increasing price risk in NR markets. These are the introducing of futures markets, growing competition in the market, the NR market becoming financialised, the improvement of communication technology, the surge in demand from China, and the impact from speculators.

In terms of price formation, RBIs believe that NR price movement is influenced by supply, demand, financial market, political situation, its stock, and production costs. For the medium- and long-term price movement, demand and supply play a crucial role.

Some RBIs make their trading plan from medium-term price expectations. However, the majority of them rely upon the shorter term, being highly influenced by financial markets to guide their trading. The financial markets comprise of NR futures, stock and other commodity markets, and currency exchange rates.

As most NR farmers are small farmers, it is unsurprising that there were some periods of price intervention schemes from the Thai government. The price intervention distorted the price mechanism between domestic and world NR markets. NR stocks can both positively and negatively impact on NR price. Finally, the cost of NR products partly affects price movements as some farmers, mostly large NR plantations, have the ability to stop producing NR during periods when NR prices are lower than production costs. As a consequence, lower supply may lead to an improvement in price.

The influences of players in the NR markets are varied as currently the market has been highly influenced by the financial market. There are several futures markets where NR is listed. Therefore, traders, such as speculators and hedge funds, highly influence the market as they are simply able to participate in the market. Although exporters are less influential on price movements than hedge funds, they are the main players in the market as they consistently participate in the market and have superior supply and demand information, especially supply. Some of them have an established trading department to monitor and manage price risk for their physical trading. It is unsurprising that RBIs believe that exporters are the most powerful players in the domestic market. The NR market has been well-known for long time to be a market of the user since there are several big users relative to millions of small producers. The sourcing behaviours of NR users have a high direct impact on exporters' sourcing prices. The exporters who receive orders tend to offer higher buying prices than who do not. Additionally, politicians have effects on NR prices in terms of price support to NR farmers, their voters. They often become involved in the market during the low price periods. Regarding RBIs, they may also have power over price movements due to their selling behaviours, but not all of them have that power. Big RBIs are likely to have more powers than smaller ones, as trading volume means power in this market. It is worth noting that the majority of RBIs are small. Finally, the group with the lowest market power in the market and least influence on price movements are the farmers, although some big plantation owners have some ability in managing their supply.

In summary of price risk implication on RBIs, a longer business cycle tends to expose the trader to a higher chance of price changes. This may have a severe impact on RBI businesses during periods of price downtrends if they do not manage the price risk

effectively. Moreover, ease of marketing NR products is another factor that indicates the level of impact of price volatility. The product that is easiest to resell is likely to be affected less by unfavourable price movements.

Having presented so far the research findings on price risks in this chapter and supply chain structures based on types of RBIs in the previous chapter, in the following chapter, the research findings with regard to NR PRM strategies in practice are revealed.

Chapter 6 Natural Rubber Price Risk Management Strategies in Practice

6.1 Introduction

In addition to the findings on the structure of NR supply chains based on types of RBIs as detailed in Chapter Four, and on the transformation of the NR market, the formation of NR prices, and the implications of NR price risk in Chapter Five, this chapter provides further findings from the research interviews, indicating how RBIs can address risk, taking into account their business circumstances. It explores the PRM strategies that are adopted by RBIs and offers an explanation in terms of the factors that influence them. With regard to PRM strategy implementation, two main activities relate to RBI trading: risk-taking decisions to buy, to stock or to sell NR, or to hedge its price risk, and the selection of market channels for trading purposes. These activities are also explored and explained. In addition, this chapter also includes the presentation of the seven perspectives of price risk environments in the context of the NR market in southern Thailand. The chapter outline is as shown in Figure 6.1.

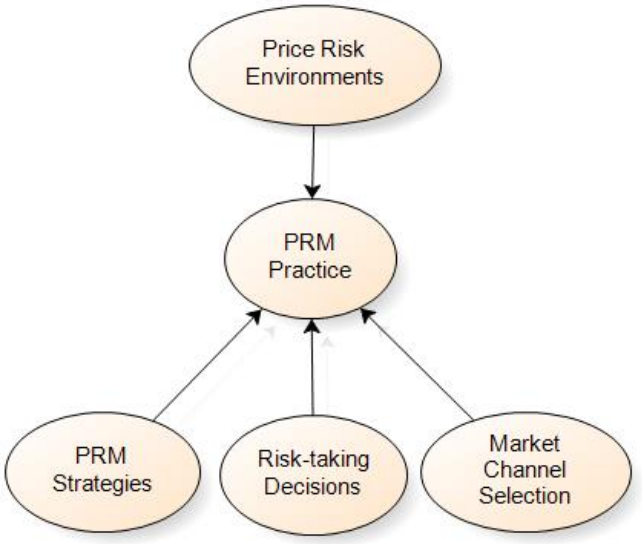


Figure 6.1: The final template of PRM practices

Section 6.2 identifies the PRM strategies adopted by RBIs, including stock holding, back-to-back selling, forward selling, negotiation, portfolio management, alternative product marketing and adaptability. Decision making in risk taking involving taking or avoiding risk, or how to transfer it to other parties such as business partners or other traders in the market, is clarified in Section 6.3. In Section 6.4, factors influencing market channel

selection based on RBIs' perspectives are revealed. After that, the factors influencing the formation of PRM strategies are identified. Section 6.5 illustrates price risk environments in relation to PRM instruments, market channels, price information, pricing methods, price forecasting methods, futures market use and technology use. This also includes the identification and taking into account of factors influencing risk taking decisions. Finally, a chapter summary is provided in Section 6.6.

6.2 Price Risk Management Strategies

In this section of the findings, PRM strategies that RBIs use in practice are introduced. The final template of PRM adopted by each type of RBI is illustrated in Figure 6.2. There are seven types of PRM strategies found: speculation, back-to-back selling, forward contracting, negotiation, portfolio management, alternative products marketing and adaptability (as shown in Figure 6.3).

6.2.1 Stock Holding

Stocking is a risk-taking strategy which happens when RBIs buy NR products, hold them in stocks and resell them later. Speculation is considered as basic price management by trading without using PRM tools to cover the price risks of their stock holdings. Therefore, they may be exposed to price risks if the prices decline.

A speculation strategy of stocking NR products is a common strategy used by RBIs in managing their businesses. For example:

> *"The common behaviour of the majority of RBIs is their preferences to buy to stockpile before reselling it. They don't like to sell in advance." (RBI22)*

RBI06 gave this opinion for the reason for buying NR to stock, coming from the price trend:

> *"Generally, RBIs' stocking habits come from their experiences in trading during previous price uptrend. They are used to it. So, they buy NR product to stock at rather high prices relative to the extent of selling prices." (RBI06)*

It is not difficult to enter an RBI market. It requires just basic equipment and some cash flow to run the business. However, marketing the products to make profits seems to be a challenging task. It needs both PRM tools more than just buying, stocking and reselling. It needs some strategies when prices are downtrending. A Latex-USS RBI said that:

> *"It seems to me that everyone can buy NR products, like USS, latex or cup lump. Everyone can buy them. What you need is some money. However, the issue is*

after you buy them. The issue is how much you will sell them for and make profits. The issue of when you should sell them." (RBI16)

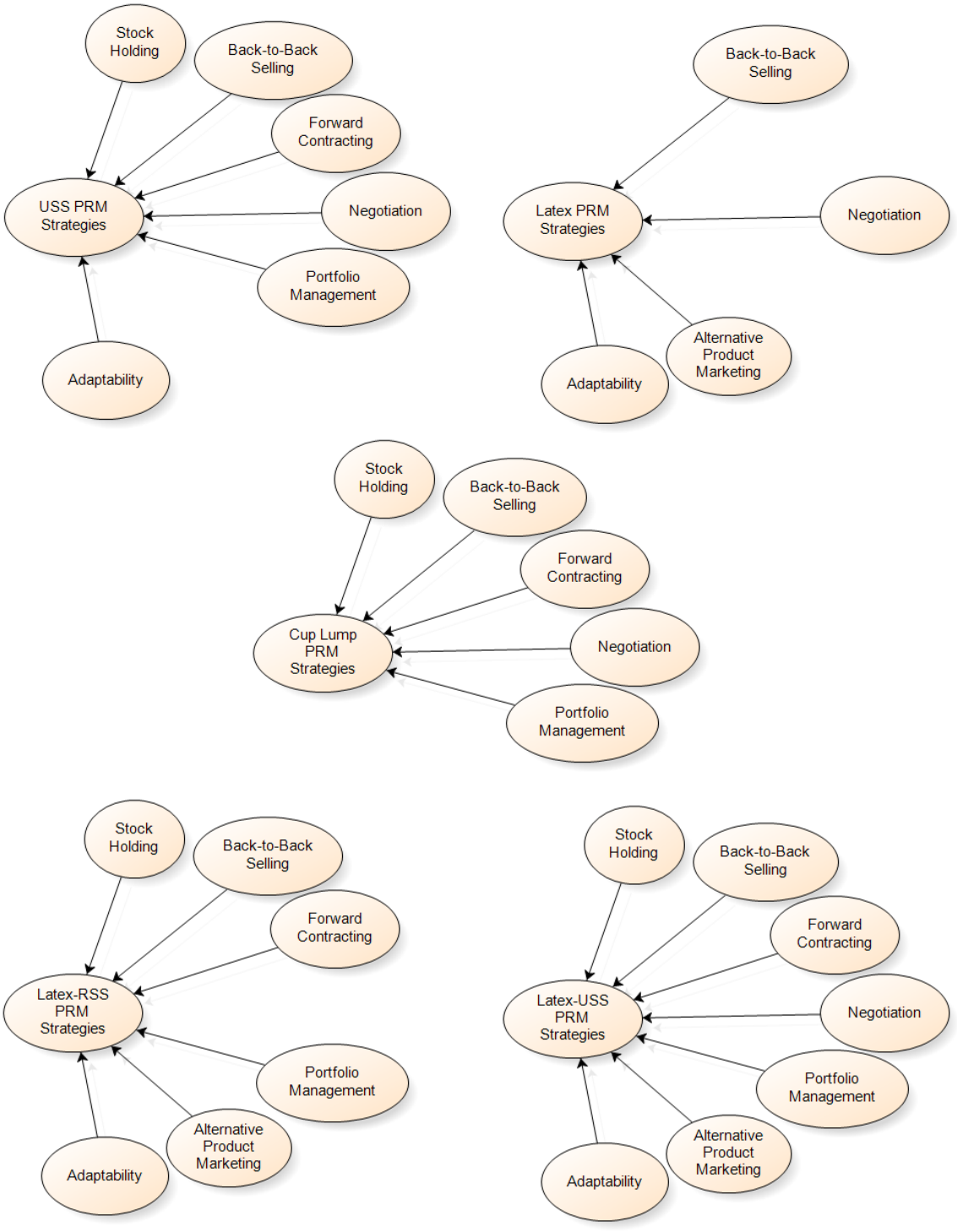


Figure 6.2: The final template of PRM strategies

However, stocking is not only adopted by start-up or small RBIs. Some big RBI businesses prefer using it, and it provides a satisfactory performance when the

businesses have advantages in terms of long cash flows. One of the highly experienced USS RBIs stated that:

> *"I buy USS from farmers. If the prices drop, I will buy them and stock a high volume. … I play a long-term game because I think I can stock up to 1,000,000 kgs. … I buy and stock it at the processors. I do not stock it at my own warehouse. I used to do it, but I was faced with many difficulties such as the insurance needed and USS deterioration." (RBI15)*

Figure 6.3: PRM strategies used by RBIs

One of the reasons is that small or start-up RBIs may be unable to gain access to PRM tools because the size of their businesses represents the marketing power in the NR supply chain, or their marketing credits need some time to be assessed.

> *"We have some RBIs that have to trade with us in a cash market because someone had just started trading. We do not provide them forward contracts until we have traded for some periods of time." (RBI14, one of the large RBIs)*

Moreover, small RBI businesses which have long cash flows relative to the size of their business are in favour of using the stocking strategy which, in turn, leads to acceptable business performance. RBI23 recalled that:

"In my previous experience, every year in August, there are high levels of supplies. NR supply will be over demand in markets. NR prices will decrease. I cannot sell in forward contracts. … The prices will keep increasing in October and November until February which is the peak of price. Then I will sell my NR stocks." (RBI23)

Different NR products have different levels of ability to stock them. Though latex may be stocked by RBIs for a day or two during the periods of rising prices, they are unlikely to do this because of the risk of latex deterioration and processor relationship management issues. RBI04 revealed:

"Sometimes, I would like to stock latex that I bought; however, it happens that latex processors ask me to supply them. I have to maintain a quota that the processors provide to me. So, even if I want to stock it I could not do it. … I have to take another risk of the latex quality. If my suppliers stocked it before and I stock it again, it means I am exposed to a high risk of latex deterioration." (RBI04)

Unlike USS and latex, cup lumps can be stocked longer than latex, but shorter than USS. RBI05, a cup lump RBI, explained the advantages of stocking cup lumps:

"In physical trading, RBIs may have the advantages in terms of stocking when the price increases. If we think that price will increase one Baht tomorrow, we may not sell today. We will stock it and sell it later." (RBI05)

He added the other advantage to using stocking strategy even when prices declined:

"If prices go down, RBIs can stock it with low costs and wait to sell it later. Moreover, if NR in their stock gets losses at the current price, they can hold the stocks until the price goes up. The RBI has capital to stock but farmers usually don't have it. They have to sell it regularly." (RBI05)

However, the limitation of stocking cup lumps is the risk of losing weight. Therefore, RBIs have to consider the trade-off between rising prices and losing weight.

"If I can make a profit for my bought cup lump, I will sell it. I do not mind if it is just a small profit because I am afraid when prices decrease for long time. In this case I have to stock for a long time and it will lose a huge weight due to the loss of water resulting from evaporation from cup lumps. It will get too dry. It makes it difficult for me to market it." (RBI05)

However, he added that if cup lumps are stocked in a proper warehouse, it could be stocked longer.

"Cup lump has to be stocked properly. It should not be stocked in the open air. It has to be kept in a closed warehouse. With a proper warehouse, it can be stocked for as much as a year. If you understand how to stock it, it can be stocked for long time." (RBI05)

The reasons that RBIs have to stock their NR products is that they were bought because they expected higher prices or the NR stock previously bought will be sold at losses in the current price. One cup lump RBI expressed that:

> *"Sometimes, I bought NR to be stocked because I thought prices would be improved. However, there were occasions that I bought it and could not resell it in time so that I could earn a profit. So, I stocked it to wait for better prices." (RBI06)*

He also commented that stocking needs price volatility to market the NR product bought:

> *"… this year prices were not very volatile. They slightly increased and then followed up with a huge decrease and they repeated with this pattern. So, it is difficult to stock this year. Stocking strategy need price volatility for making profits. (RBI06)*

Another reason for stocking is because of the limited volume in forward selling that NR processors provide. Moreover, on many occasions for many processors, they offer spot prices higher than those of forward contracts and of stocking at processors' warehouses. RBI12 revealed that:

> *"If it is over the quota that the processor A is given for forward selling, I have to sell in spot markets. Usually, its spot prices are higher than forward prices. If you sell to the processor A you have to understand that you have to deliver within a week, otherwise they will chase you up to deliver it." (RBI12)*

RBI24 explained the effect of high competition in some locations on stocking as such:

> *"There are too many competitors, resulting in a lot of problems. When there is low supply of raw material [latex] but market demand is still high because of the many latex processors, it [latex] will be overpriced. … I have to buy it but have no idea where I can sell it to make a profit. I have to wait for higher price. Otherwise, I have to buy it more when it is at a cheaper price to lower the average price. I have to rely on the average buying and selling prices." (RBI24, a Latex-RSS RBI)*

6.2.2 Back-to-back Selling

Back-to-back selling is considered as a riskless trading strategy. The process is simply buying NR products and hedging them by using PRM tools to transfer price risks from their businesses. The back-to-back selling strategy needs PRM tools to deal with price risks. One of the popular PRM tools is a forward contract. One of the RBIs expressed his experience in using the forward contracts as a hedging tool:

> *"Back-to-back selling means that you will gain 1 or 1.50 Baht/kg but you will earn profit continuously. It may better if you are waiting for 5 Baht/kg but when you*

actually sell it you might come up with loss of 5 or even 10 Baht/kg. With back-to-back selling it is easy to deal with price risks." (RBI21)

Even though futures contracts are available in the NR industry in both domestic and international markets, they are rarely used by RBIs. This may be owing to the inefficiency of AFET, the domestic NR futures market. One of the USS RBIs described:

> *"There is a lack of liquidity in AFET. You first have to understand how to play in the AFET. You need several days before you can get out of the market. You have to speculate in the long term. You have to wait two weeks or a month for your money. You cannot get in and out in this market." (RBI09)*

The international NR futures markets, such as TOCOM, seem to be more efficient. Nevertheless, they are too complex as they are tied to the currency exchange rate. For example:

> *"My friend usually used AFET for hedging price risks. … I do not want to get headache about the currency exchange. I do not want to get involved in it as a part of my physical trading in longer term plans like 10 days. I traded in TOCOM only for speculative purpose and it was in a day trade. I usually open and close position within a day and rarely do it overnight." (RBI09)*

Another factor which is a barrier to using the international futures market as a PRM tool is the inaccessibility of RBIs to the markets.

> *"At the moment, Thai trade in TOCOM is illegal because there is no TOCOM representative for trading in Thailand. So, they have to trade via brokers in other countries like Singapore. I heard the news that one of the Thai brokers would provide the service but have not seen it yet." (RBI11)*

Although back-to-back selling could be used by some big RBIs, they do not always use it as this strategy locks up the profits which tend to be small. One of the USS RBIs commented that:

> *"… Back-to-back selling deals with the price risk because it is certain of marketing costs. When I bought it, I set the margin about 0.60 – 0.70 Baht. So, for one truck delivered, I will make around 7,000. Then, when I discount it with operational costs, the rest is mine. However, mostly I depend on speculations because when prices go up or down by one or two Baht, the profit margins are significantly different to operational costs. So, RBIs prefer speculation rather than back-to-back selling." (RBI10)*

However, in NR processing businesses, like Latex-RSS or Latex-USS, where there are high profit margins in some periods of time, they prefer using this if relevant PRM tools are available. One of the Latex-RSS RBIs said:

"I need forward contracts from the Hat Yai auction market. I require only three days in advance to match to my operational time. So, I can hedge price risk to what I have in physical stock. I, sometimes, cannot deliver all of them because of the truck capacity. So, I can deliver the rest later without exposure to price risks. It will help me a lot in the periods of price downtrends." (RBI08)

During the periods of stable prices, back-to-back selling seems to be one of the strategies reducing price risks effectively. An RBI explained:

"When prices are stable, I have to do back-to-back selling. It is lucky that currently the processors offers cash market prices higher than other processors' buying prices. … I do not have to take a higher risk. If the prices are stable and one processor offers a higher price for a spot market, I will sell it as back-to-back. I will buy it and deliver it to sell immediately if I can make profits." (RBI12)

In the case of price volatility and when RBIs are not uncertain in price directions, back-to-back selling is one of the PRM strategies they usually adopt. RBI12 further commented that:

"If prices are volatile, I will buy and sell more quickly than usual. I can accept some level of price risks. I will trade in the shorter term. I will not stock it for long. If I am uncertain, I will sell my stock in order to reduce price risks. For example, if I buy it today and I am afraid of making losses, I would sell it and leave my stock empty. If I know that I can make a profit, I will sell stocks and hold cash instead." (RBI12)

One of the limitations of back-to-back selling is that it may make RBIs less competitive. RBI21 revealed that:

"Back-to-back selling is usually impractical because there are my competitors that may buy above my price. My customer will go to sell to them. … In addition, we always have to take risks by buying at above market price if we know that processors will increase buying prices to attract their customers." (RBI21)

Another limitation in practice of the back-to-back selling is the insufficient volume to transport in a daily basis. One of the USS RBIs mentioned that:

"Back-to-back selling is good as we will know for certain how much we will make daily. However, there is a barrier to implementing this strategy because we cannot buy enough NR products to transport at full capacity. We have to pay high costs for that from operational, oil and management costs. So, if it is not enough to be full capacity, I will stock it. Nevertheless, if we can buy high volume enough to transport, back-to-back selling is a good choice." (RBI19)

6.2.3 Forward Selling

Forward contracting is in widespread use amongst RBIs. They need some level of credits to get access to the tools, mostly coming from the volume of NR traded or trading history records. One of the large USS RBIs commented:

> *"We have to assess their potential to supply. We will see their volume of supply. For example, if you could supply us 10.000 kgs monthly, we will allow you to sell in advance at the current price of around 5,000 kgs." (RBI14).*

It is worth noting that forward contracting in Thai RBI business is informal. It is in verbal form rather than on paper. One of the RBIs revealed that

> *"Forward selling with exporters has advantages in that we can sell at any volume, such as 1,000 or 2,000 kg. However, there is no paper contract. It is just verbal. It may lead to contract default. But mostly they will not default as the NR industry is small. That is the price hedging mechanism that I use." (RBI22)*

Due to the contract having been arranged in an informal way, no law enforcement is applied if contract defaults happen. The contract defaults are likely to occur during the price volatility periods. The common punishment they use is to inform RBIs the names of those who break the contract which, in turn, leads to losing marketing credits in trading. A large USS RBI said that:

> *"For example, one made with me a forward contract at 70 Baht/kg for 10,000 kgs. He promises that he will keep delivering it whether the price will go up or down. …. However, when the price significantly increases to 90 or 100 Baht/kg, he changes his mind and does not deliver it. I will not trade with him anymore. I will keep informing other RBIs that he had defaulted on his contract. Moreover, I will inform the processors as well." (RBI15)*

Moreover, forward contracting is not only used in hedging price risks, but it is used for speculative purposes as well. In this case, RBIs arrange forward contracting without holding stocks of NR product in physical markets and then sourcing the NR products. Another of the USS RBIs commented:

> *"Using a forward contract as a speculation may result in big gains or losses because of the high volume of trade. If we think that prices will go down we will sell in advance and if we are very certain, we will sell it in big volume. … If I think prices will decrease in the longer term, I will manage to negotiate with the processors for the higher price. For example, I offer them for 100,000 kg and see whether they can give me better prices as I trade in a high volume." (RBI07)*

Forward contracting seems to be a powerful tool in the NR market during the price downtrend periods. Those who have the capability of utilising forward contracts tend to have the advantages to those who do not. One USS RBI described:

> *"Sometimes, I would sell it in advance. … When prices dramatically drop, it would be a good profit. I notice the processors' buying price; if it is on the verge of collapse, I will sell it suddenly. At the event, the majority of RBIs make profits. This kind of event rarely happens. So, I have to take an advantage from it." (RBI10)*

However, having forward contracts is not without risks. The time constraint in delivering NR products is a salient example. NR productions rely mainly on weather and it is almost unpredictable. Having forward contracts during the rainy periods may lead to sourcing problems which, in turn, lead to losing trading credits. RBI22 stated that:

> *"I do not like to sell it in advance because I do not know that I can buy the right amount of NR from farmers." (RBI22)*

In some cases, the contractors may cancel the contract if RBIs cannot deliver in the given time regardless of the lowering of market prices against forward contracts which in turn translate into RBIs profits. For example:

> *"Once, I sold in advance for 10,000 kgs. The processor asked me to deliver it but at the time it was raining for long period. So, how could I buy it? They forced me to deliver within 15 days, otherwise they will give up the contract and my credit in selling in advance for later occasions. At the time, my forward contract was at 70 Baht/kg, and the spot price at 65." (RBI21)*

Another issue in having forward contracts is the increase of NR prices. Therefore RBIs have to run their businesses with losses.

> *"During the periods of NR shortages within the country but low demands in user countries, I have to buy it at the 4 – 5 Baht/kg higher prices in the international market. Because there are low supplies in the country but the world economy is not good, it has to be divided between domestic and international prices. RBIs have to refer to the domestic prices but I have to sell to processors who refer to world market prices. It is the shortage of supply; so, RBIs have to compete for a limited NR supply." (RBI20)*

One of the issues in forward contracting is that the function is not available all the time. It is dependent on business partner decisions. It tends to malfunction during the periods of high price volatility where RBIs barely need it. One of the cup lump RBIs commented that:

"I want NR processors to allow me to sell in advance all the time. Sometimes, they offer only spot prices but do not allow me to sell in advance. Cup lump needs to sell in advance if I want to reduce price risks because it requires to be processed before it can be resold." (RBI06)

Unlike a stocking strategy, the advantages of forward selling are that it does not need warehousing and high capital. RBI14 expressed that:

"If NR prices are in downtrends, it is easier to make money. The reason is that it does not need a warehouse to stock NR products and not much money in cash flow. We just arrange forward contracts with processors. … I can buy today and then resell to processors to make 5 Baht/kg. On the other hand, if you stock it at 75 Baht/kg and wait until the price increase to 80 Baht/kg. You need 75 million Baht for stocking." (RBI14)

6.2.4 Negotiation

Using marketing power to source best possible prices for their collected NR products from buyers is one of the PRM strategies popularly employed amongst RBIs. It is obviously seen that this strategy requires RBIs to gain marketing power, usually the NR product volume traded, in order to keep asking and negotiating selling prices to whom they supply NR products. Their businesses rely on sourcing NR products for NR buyers and sourcing selling prices from their NR suppliers. With the high volume NR products they trade, a slight advantage of derived selling prices may be transformed into high profits and mean their businesses remain competitive. This commonly takes place in latex supply chains.

"I have to research other RBIs in and around my area to see whether they reduce buying prices. I have to be competitive even though I, sometimes, do not receive the selling price that makes me profits. … For example, today if I buy it at a price that is too high; they may help me to buy just one trailer of it at the price. For the rest, I have to deal with it on my own." (RBI04)

It is not only widely used by latex RBIs, but one of the biggest USS RBIs adopted this strategy as well since they have high marketing power to negotiate to NR processors. For example:

"We have to make good relationships with many processors. We could sell to every processor. For example, we have to offer to this processor for 100,000 kgs, and others for 50,000, or 60,000 respectively. … So, we will make offers to many processors. Processors know their quota of how much volume they can buy because they usually sign contracts in advance quarterly. They know whom they will buy from" (RBI14)

Moreover, some RBIs built up a network amongst them in order to gain power in negotiations. One of the latex RBIs stated that:

> *"We have to form a group and have the same aims. I am a leader. Others are from different locations and they have businesses as big as mine. They will sell rubber to me. I behave like the collecting point for some of their volume but I will not make any profits from them. We just want to build up the volume because when we sell it with high volume we can negotiate for selling prices. This is because the market power relies on the NR volume that we are ready to sell and deliver to them." (RBI10)*

Their network has a diversity of locations which, in turn, leads to the reduction of supply risks, considered as an important factor in NR markets. He also expressed that:

> *"If processors demand raw material and we can deliver to them within two or three days, they will offer us good prices. This is the original reason why we formed our group. Sometimes, location A does not have NR but location B has. … So, we can offer processors a bigger amount. My role is to contact processors. … For example, you have to tell the truth about the price you were offered by processors otherwise we cannot trade together in the long term. It depends on honesty as a first priority." (RBI10)*

However, market power does not only derive from the volume in trading. One cup lump RBI stated that he gains it by becoming a processor's representative at a collecting point:

> *"A processor appointed me to be its representative at this location. The processor accepted me because of my honesty. I supplied it until I proved that I was reliable. I have kept supplying it so that it can operate continuously." (RBI05)*

There is evidence indicating that, in NR trading, an RBI needs the negotiating ability to gain concessions in trading in order to manage business in times of uncertainty. RBI12 mentioned that:

> *"My husband told me that he did not like to trade in futures markets. He thought the market situations were easy to change and it is difficult for him to negotiate because there were too many participants. On the other hand, if he negotiates with processors, it is easier. It is a face-to-face negotiation. He preferred to deal directly with processors where he has power to negotiate. For example, if he would like to sell his stock after prices went down, he could ask for a better price." (RBI12)*

6.2.5 Portfolio Management

Portfolio management is a strategy utilising existing PRM tools in order to implement a business plan. The basic PRM tools commonly used are forward selling, stocking and cash markets. RBI11 expressed that:

"If I am uncertain in a situation, I will do back-to-back selling. It may make small profits but it is guaranteed. However, if there is a situation that I think the prices are at their lowest and are unlikely to go lower, I will start stocking NR products. On the other hand, whenever I think the price is too high relative to fundamental factors, I will sell with forward contracts. Overall, it depends on the particular situation on the day." (RBI11)

Even though, the strategy depends mainly on a market analysis which tends to be not an easy task especially during a turbulent market. Some RBIs adjust their portfolios to meet the underlying market conditions. For example:

"It depends on which RBI levels you are. What extent is your capital? If you are a three-day RBI, it means that you cannot stock NR product for more than three days. … Your marketing plan has to rely on your level of RBI. I used to be a one-month RBI. I have enough capital. However, now the market mechanism has been changed, it does not work like it used to. I changed to a plan of the level of ten-days. I speculate what the market should be in seven to ten days. It does not depend on my capital. I could stock it for one month to two months. However, it is difficult to speculate for a longer time than this because prices are volatile." (RBI11)

RBI12 also added that she collects a range of data and analyses it before she decides the action to be taken:

"I have to rely on market situations which lead to my PRM decisions. I gather the data of the physical market and the world economy. I have to see a variety of data in order to decide whether to sell in advance or stock it. Otherwise, you may get huge losses." (RBI12)

RBI09 mentioned that he made a plan for a week in advance from analysing price trends from some particular types of data:

"Every week, I will summarise my report briefly about currency exchange analysis: such as the yen and the dollar. It includes gold and crude oil prices. I do it weekly and I will plan to trade a week in advance. I summarise it from a technical graph of the prices. In this way I can see a draft market picture for the next week." (RBI09)

One of the advantages of the portfolio management strategy is that it can be corrected by previous decisions that may have been wrong. For example:

"If the decision I made is right, I will make profits. However, if it's wrong, I am able to correct it later. For example, the price decreased to 60 Baht/kg from 100 and I kept selling in forward contracts. Then that price rebounded to 65 Baht/kg. I stopped selling in advance and kept buying to cover the forward contracts. The rest of my stocks cover the contracts that I can make profits on without being upset by the losses of my previous decisions." (RBI07)

The portfolio strategy relies on a market analysis of the future to take a position in the market. Such market situations may change; therefore, the market positions that RBIs took may be not right regarding the current market. The portfolio adjustment plays an important role in this situation. One RBI mentioned that the portfolio can be adjusted easily to the current market situation:

> *"It is important to note that the technical graph will not tell me just the next week. It will tell me one month in advance. I can plan how I should deal with physical, with AFET and TOCOM trading, and which price I should be looking for. … If my plan goes wrong, I have to adjust it. I have to reanalyse the market during the midweek. However, I usually analyse and plan it on Saturday." (RBI09)*

RBI20 suggested that RBIs have to know how to reduce price risks in their portfolio if they get losses. He stated that:

> *"We should know how to cut losses in the first place in order manage price risks. … Every commodity trader has to set taking-profit and cutting-loss points. I do not like to take high risks. I have a reference point in my mind. If I can get to that point I will be satisfied. I rarely participate in futures market, because I think it is too high risk." (RBI20)*

6.2.6 Alternative Product Marketing

As some of NR products have the capability to be transformed into other products, alternative product marketing seems to be a good strategy to use when price movements of main NR products traded are not favourable. Latex is a good example. It can be traded in a latex market and also transformed into rubber sheet products such as RSS and USS. Therefore, the competition between different NR supply chains is inevitable. RBI processors may decide to sell latex into latex markets when latex prices are above rubber sheet prices. One of the RBIs commented:

> *"The advantage of being latex processors is that they can buy latex and resell it into latex markets if rubber sheet prices are not good. They can act like latex merchants." (RBI15)*

However, due to some conditions of the business, RBI processors may not sell all their latex but keep some to be processed in order to maintain production lines. One of the Latex-USS RBIs said:

> *"Sometimes, I have to bear losses on some levels in order to provide gains on others. I may keep processing half of them but another half I will sell as unprocessed latex. I try to reduce losses as much as possible. The reason why I keep processing some of them is because I have to make some jobs for my workers." (RBI16)*

The differences in prices between latex and rubber sheet are not the only factor that influences processors to go to alternative markets, but price trends as well. On some occasions, RBIs processors may not decide to market their products as latex, although latex prices were beyond rubber sheet prices at one time. This is because they expect the rubber sheet prices would be improved and the rubber sheet products are storable.

> *"If I think that prices will increase, even though a price difference between RSS and latex is equal to 5 Baht/kg which is less than my production costs, I will decide to process it. This is because eventually I have to buy latex at a higher price next week. However, if I feel uncertain about price trends, I will stop producing it and keep buying and temporarily selling it as latex." (RBI22)*

In contrast, latex business intermediaries may consider processing latex into rubber sheets during the periods when rubber sheet prices are getting higher than those of latex. RBI03 mentioned that:

> *"If it is possible, I would like to do it [processing latex into RSS] because it will reduce risks during the periods of price fluctuations. However, I am concerned about a water pollution problem from the process." (RBI03)*

6.2.7 Adaptability

Despite RBIs deciding to sell NR products to alternative markets in the short term, some of them, occasionally, adapt to a new business environment in order to deal with medium term business environment changes. Some RBIs experienced the period of the government's price intervention. As a consequence, they adapted the way they manage their businesses in order to survive or even to get an advantage from the situation.

A latex RBI recalled that she suffered from this intervention as she expected price improvement and she decided to process latex into rubber sheets to stock it.

> *"I held stocks because I thought the prices would increase to the intervention scheme's target price. I managed to stock hundreds of thousands of kilograms of RSS but finally it did not actually meet the target price. The price kept dropping. As a result, I made significant losses. Because the government set the target price at above market prices in their market intervention, I decided to stock NR products. I lost a lot." (RBI01)*

A Latex-USS RBI recalled when he adapted to the intervention market in order to recover from the loss from the stocking from early stage of the price intervention.

> *"The government launched the scheme to intervene in the market price in order to reach a target of 120 Baht/kg. At the time, I assumed the market price was 110 Baht/kg. On behalf of an RBI, I stocked it. The government told me that the price*

would rise to 120 Baht/kg. I believed them. ... as a result I got serious losses from stocking." (RBI16)

He also explained that how he could change the situation from negative to positive business performance by adapting to the market environment.

> *"I thought how I could deal during the government's price intervention scheme and get the advantages at the same time. … Then, I gathered the evidence of NR plantation owners of my latex customers as the regulation stated. Finally, I could sell at the intervened price: from the market prices at 70-75 Baht/kg to the intervened price at 90 Baht/kg. The situation has been changed from at the beginning when I got losses of 300,000 Baht to at the end, I gained the profits of hundreds of thousands of Baht." (RBI16)*

However, an RBI who applied a similar strategy to the Latex-USS RBI mentioned above to a similar situation had a different business result as a result of the delay in payment from the government. He indicated that:

> *"We [RBIs] had to try to find a way to sell our NR products to the intervention market as other RBIs did. However, when we entered the market, it seemed to me that we had to accept the consequences of delay payments, which have had a huge impact on our businesses. … when we had such a small amount of money left, if the prices go down, we would have been forced to sell it with losses in order to buy new latex to be processed." (RBI24)*

Some RBIs decided to wait until the end of the government's intervention period to return to usual business. A USS RBI who owns a big NR plantation encountered a slight impact as she had a quota to sell NR products to the scheme.

> *"… I own an NR plantation, … I did not have much impact from it. However, I could buy less. I told my customers to sell to others who gave them a higher price than mine. I maintained the relationship of my customers by telling them nicely. As a result, after the end of the government's NR price intervention period, I did contact them and they have come back to me and traded it as usual." (RBI12)*

It is worth noting that the government intervened in the market only in respect of NR in particular grades (USS and RSS). Therefore, cup lump product had no direct impact from this intervention scheme.

Table 6.1: PRM strategies and factors influencing them

PRM Strategies	Factors
• Stock Holding • Back-to-back Selling • Forward Selling • Negotiation • Portfolio Management • Alternative Product Marketing • Adaptability	• Types of RBI Business • PRM Instruments • Business Size • Resources • Knowledge • Experience • Location (Competition in the Market)

All in all, Table 6.1 summarises PRM strategies that have been found to be employed by RBIs as presented in Section 6.2. Furthermore, the table also provides a summarisation of the relevant factors that influence their adoption by RBIs. Such factors are RBI type, kinds of PRM tools available, size of the RBI business (volume in trading), available resources such as working capital and warehouse size, knowledge such as their ability in terms of trading in the futures market, trading experience and, finally, location (market structures and competition in the markets).

6.3 Decisions in Risk Taking

Decision making in PRM by RBIs is a main task within their businesses. They have to make such decisions frequently, almost on a daily basis. Although they will gain feedback from decisions later on, they may face difficulty in assessing decisions because they are made under complex and uncertain circumstances. In this section, how RBIs make decisions in price risk retention, transfer and avoidance, and what factors influence their decisions, are investigated.

6.3.1 Decisions in Price Risk Taking

Decisions in risk taking are a daily activity in NR intermediary businesses. Such decisions are made based on the available PRM instruments and relevant PRM strategies that have been adopted. There are three types of decisions in risk taking as follows:

Firstly, RBIs are considered as price risk takers if they do nothing about PRM, since they hold NR stocks as the nature of their businesses. Those who hold forward or future contract positions without holding physical stocks also fall into this category.

Secondly, price risk-averse RBIs are those who use PRM tools to compensate for physical trading positions, or who adopt back-to-back selling strategies.

Thirdly, RBIs who are likely to vary between price risk taking and risk-averse positions according to the conditions of the business environment are considered price risk neutral.

In the everyday life of running businesses, RBIs' decisions to buy, sell and store NR product are relevant to risk taking. Risk-taking traders buy NR products and hold them in stock, while risk-averse traders are always hedging price to compensate for their holdings of NR products. This is rarely the case in RBIs. They seek opportunities to profit from market movements. RBI10 revealed that:

> *"I think it depends on the right speculation. There are price risks all the time, but if we can deal with them, they will become profits. Trading in rubber can make profits from either price increase or decrease, what you have to do is to speculate in the right direction. However, if you do it wrong, you will make losses. It depends upon whether you analyse the market correctly." (RBI10)*

There are the small margins in their business, due to highly competitive markets. As a consequence, they were forced to be price-risk takers in order to survive. Another RBI stated that:

> *"There are many rubber merchants now. So, they compete with each other for the limited rubber supply. There is the same quantity of rubber products in the market as there was before, but there are more merchants now. As a result, they use buying prices to fight others. The benefits will only fall to farmers. We [RBIs] cannot make profits on some occasions. Sometimes, we even take losses." (RBI12)*

Nonetheless, in general, most RBIs are NR stock holders, as the nature of their business is to buy and resell NR products. This may be because, to manage price risks, they require PRM instruments, and only some of which are available to them. Accessing forward contracts, the main PRM instrument in NR trading, requires market power and good relationships, as they are organised informally. For example:

> *"We use the telephone to arrange a forward contract. It is a verbal contract. If you want to stay in the rubber trading business, you have to be credible. You have to deliver what you have sold in forward contracts. If you don't honour the contract,*

your name will appear in the black list of contract breakers. As a result, your future trading will be dismissed. Processors will not trust you in providing forward contracts. Moreover, they even sometimes refuse to trade with you." (RBI14)

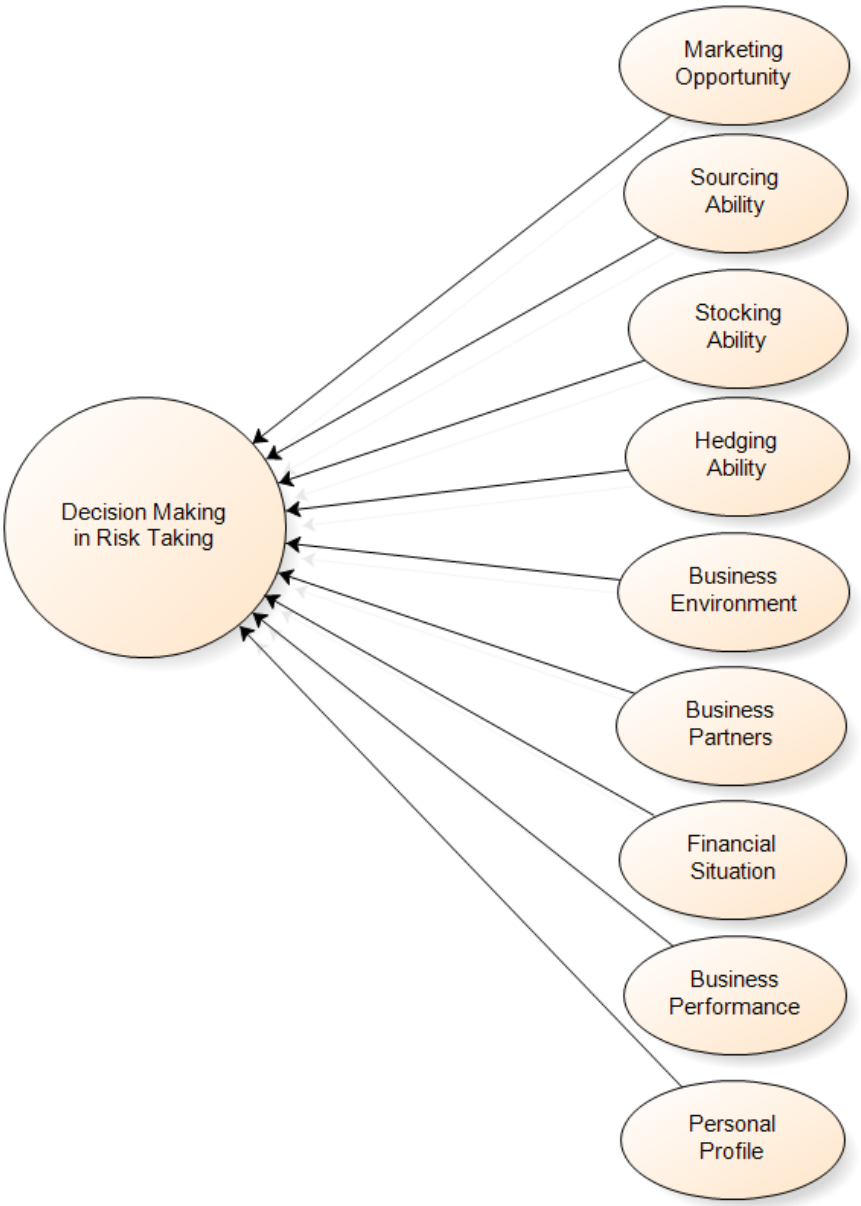


Figure 6.4: The final template of factors influencing decision making in risk taking

Even RBIs who are able to use PRM instruments find making decisions in risk taking under NR price volatility challenging. For example:

"You have to be quick. If I cannot follow updated information, I will lose. If the price decreases and I do not sell in forward contracts, I will get losses. For example, if I bought it [NR product] when it was 100 Baht/kg and sell it at 80, I will lose 20 Baht/kg. On the other hand, if I sell in forward contracts and then prices go up, I will lose as well." (RBI18)

All in all, opportunity seeking is a common behaviour of RBIs. They run businesses under highly competitive and price-uncertain circumstances. Thus RBIs are considered risk-neutral.

6.3.2 Factors Influencing Decisions in Price Risk Taking

There are a range of factors found in this research that have an impact on risk-taking decisions based on RBIs' perspectives. This subsection investigates factors influencing decisions in risk taking, as shown in Figure 6.4.

6.3.2.1 *Marketing Opportunity*

RBIs' decision making in price-risk taking depend upon the current and future opportunities, as illustrated in Figure 6.5. More details are as follows:

Figure 6.5: The final template of the marketing opportunity factor

- **Current Market Condition**

Trading at above market prices is common in the NR market. This is because good offered price is the key factor for RBIs, who hold stocks, to decide selling them. RBIs rely upon the stocking mechanism when current market prices are at a discount, and resell stock when current prices are reasonable or at a premium. One RBI expressed:

> *"If a processor has a shortage of supply, it will offer us better prices. There is a shortage of raw material in production. Sometimes, they have long-term contracts to export. … Processors have orders to be fulfilled. If they lack the raw material [NR], they will offer higher prices. In contrast, if they have over-supply, they will offer lower prices." (RBI14)*

She also revealed that she decides to sell NR whenever she thinks the price is right, regardless of the possibility of future price increases, to avoid the discount prices offered by buyers.

"I sell it when they [processors] want to buy it. … I will not sell it when they do not want it. For example, there are oversupplies of rubber during the periods between October and December every year. During these three months prices will decrease. Though there is market demand, it will be traded at discount prices because of plentiful supplies. … I will stock it in the second half of December and then start reselling it after New Year. Processors will buy at lower prices and put the prices up to sell it." (RBI14)

RBIs have to balance between the current price offered and the price expected in the future in their trading decisions. One RBI explained:

"If I think processors are short of raw material and there is high demand in world market, I will speculate. However, if there is a short fall but demand is not high, I will not stock it." (RBI06)

One of the criteria to consider whether the current offered price is advantage is to compare with price in SICOM. RBIs use it as a benchmark price to make a daily trading decision.

"I consider this [He indicates NR prices in SICOM on his laptop] and incorporate it into my decision. I will compare this price by multiplying with the currency exchange rate, with what processors offer to me. For example, if the price in SICOM equal to 80 Baht/kg, … If they offer me 74, it is a good price." (RBI16)

- **Expected Price Movement**

The price RBIs expect is the key factor in their marketing decisions. They hold stock if they think the price will rise, while they sell in forward contracts if they expect the price will fall. Since the NR market relies highly upon future prices, it is highly competitive. Therefore RBIs depend on speculation rather than a certain profit margin. For example:

"Rubber trading depends on speculation. Unlike other trading that has certain profit margins, I cannot buy and sell it [NR product] comfortably. I have to see the world market. I have to analyse it for myself, if it will increase or decrease. There are only some occasions that I buy it at a profit; for example, in the periods of oversupply. … So, I can buy it at discount prices. Eventually, it is the issue of futures in trading rubber. There are historical data to be used partly in the future prices. I mostly use demand and supply data." (RBI20)

Since NR trading relies on future prices, some RBIs use the level of supply to predict future prices. They stock up during periods of plenty and hope that the price will improve in periods of low supply. One RBI explained how he manages it:

"Sometimes, trading rubber depends on future prices. Seasons also affect my decisions. For example, during raining to drying season, rubber begins disappearing from the market. I will stock rubber in this period because

processors have to buy it every day, every month. Sometimes, the balance of supply and demand of goods determines the price." (RBI05)

Even the NR product which is likely not to be stocked, price expectation still has high impact on latex RBIs speculation. One RBI revealed that she may stock it for just a day to make profits from price rises.

"I am very pleased when prices rise. The more they increase, the more I am satisfied. I will get the benefit from stocking it [latex] for selling in the next day. I will preserve it." (RBI03)

6.3.2.2 *Sourcing Ability*

NR product marketing is not the only challenge to RBIs in their businesses; product sourcing is another frontier. Buying NR products in this competitive market is another factor influencing RBIs attitude to price-risk. Their business by nature relies partly upon NR price movements. As a result, they can profit when prices go up by reselling NR stock or when prices go down by buying NR product to cover their forward selling contracts (if they have them). Therefore the opportunity to obtain NR products from physical markets plays a crucial role in risk-taking decisions in RBIs' businesses. Sourcing ability comprises of stock holding, season and weather and ease of sourcing, as presented in Figure 6.6.

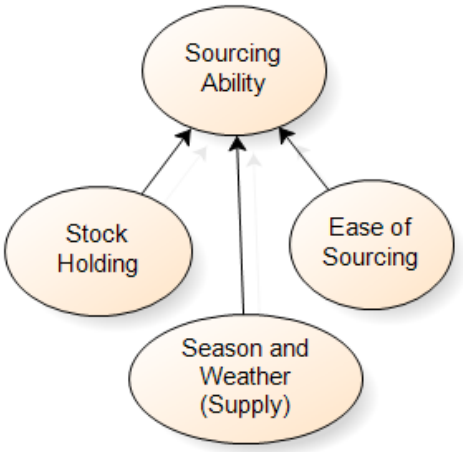


Figure 6.6: The final template of the sourcing ability factor

- **Stock Holding**

RBIs' stock holding constitutes both an opportunity and a risk. They have to make decisions about the level of stock they would like to hold. The ability to immediately supply buyers is one way to gain market power in NR trading. As a consequence, RBIs

need to hold stocks to capitalise on market opportunity. However, stocks are subject to the risk of price falls. RBI20 said:

> *"If sometimes I have many customers, I have to sell some of my stocks. I have to consider whether I hold too much stock to handle it. If it is over my management capability, I have to sell part of it." (RBI20)*

Another RBI explained how he divided his capital to manage price risk from stock holding. He reduced risk by selling NR to maintain the stock he held. He revealed that:

> *"I have to consider my capital and market opportunity, whether I can handle more stock. If I think it is too much stock, I will buy new rubber and sell it suddenly. I will separate my capital into 70% for stocking and 30% for back-to-back selling. … I need some of it to keep running my business. This is because if I don't have money to buy new rubber, I will lose my customers to other shops. If they change to other shops, it is difficult to persuade them back. I have to retain customers with us. So, I cannot stock rubber at 100% of my capital." (RBI21)*

In order to gain the benefits of market price increase, RBIs require some level of NR stocks. Therefore, they are likely to seek higher risk if the stocks are low. However, if they hold enough stocks of NR, they have to avoid taking high price risk. For example:

> *"If I have a low level of stock, I will decide to buy. However, if I hold enough stock, I will not buy if it is overpriced. There are many RBIs relying highly on speculation. It doesn't depend on just me but my competitors as well. Sometimes, I offer a lower buying price relative to that of the previous day, but my competitor thinks differently; so, they offer better prices. As a consequence, I cannot buy much rubber because I think the market is not good. However, when they [his competitors] decide to buy at a high price, I have been forced to do it as well to maintain my competitiveness." (RBI06)*

One RBI stated that he has to maintain the NR stock at a level of acceptable risk. If stock is too great, he will have difficulty in managing risk in the case of price movement in his favour. Therefore, he needs an alternative plan for that case.

> *"If I hold the stock too high, I will feel frightened. If it is in the level that I can accept the risk, I will not be afraid of it. If price is more decreased, I will buy more. If I would like to play safe, I will hold stock for 30% of my capital. The rest of 70%, I will use it in case that it is varied from what I expected. … However, if I run out of cash before, I may be forced to sell it at losses." (RBI22)*

- **Season and Weather**

As well as the weather, which affects the NR supply to market, the NR production season is a crucial factor. Although there are three main NR products available throughout the year, when rubber trees are cut back to be tapped after the drying

season, the majority of NR product is cup lump. This is because of the high level of Dry Rubber Content (DRC), and low production in this period.

> *"If I am going to sell in advance and the weather forecast shows that it will be a raining period, I will reconsider, because low supply also has an effect on price. If there is a long period of rain resulting in shortage of supply, prices will rebound. Merchants [RBIs] will compete for limited supply resulting in the price going up. For example, there is low supply in Surat Thani. They may move to other markets, like Krabi, to compete for rubber." (RBI24)*

Another RBI also mentioned how future NR supply influences his decision in price risk taking. Weather is the key factor that directly influences NR supply. RBIs have to balance between the price movement and weather factors in their risk decisions.

> *"The volume that you sell in forward contracts depends on how you see the market. For example, you speculate about how much the price will drop and how long it is going to be. If you think it will drop dramatically, you can sell a lot. However, if you think it will drop in a short period, you can wait. Despite these, you have to consider the fundamental factors such as if it will be rainy. If it will be heavily raining, rubber supply will be low. So, if you think to sell in a high volume, you have to think over. Otherwise, you will be faced with difficulty in sourcing." (RBI16)*

- **Ease of Sourcing**

Since NR price movements are similar to those in the stock market, some RBIs who have the ability to source new NR product easily have adopted a trading strategy borrowed from stock traders. That is to sell NR in physical stock if the price cannot break the resistance line. One big RBI said:

> *"The way I manage risk is like trading in the stock market. When the price reaches the resistance line and cannot break it, you have to sell. It depends on how much risk you can accept. Sometimes I have decided not to sell my stock but when the price drops to the point that I will get losses, I will cut losses. That is I will sell all my stocks. I will sell it for gaining nothing but I do not mean I will lose from it. I will sell it in order to get money back to restart trading." (RBI14)*

In contrast, small RBIs who have limited capability to source NR products tend to decide to take more risk by not selling the stock even when prices go down. Instead, they buy more NR so that they can make profits when market prices are above the average costs of stocks. RBI23 expressed that:

> *"If I am holding the stock for 2,000 kgs which I bought during high prices, I will not sell my stock and will buy more. For example, from the loss of 10 Baht/kg, I will keep buying it to lower the average price in stock. I will wait until the price gets*

higher, at the level at my stocks can make profits, and sell it. I will get profit from that." (RBI23)

One of the reasons that some RBIs hold NR stock even when it is in loss is that, as RBIs, NR in their stocks constitutes an opportunity to make profit. Supplies are not always available. For example, when prices are trending upwards, NR is difficult to source. Another of the RBIs mentioned:

> *"If prices turning from decrease into decrease, rubber will disappear from the market automatically. There is an issue of our suppliers that they will not sell their stocks. I have to look at somewhere else. If I think prices will keep rising, I will source it from auction markets. We have to offer higher prices than others." (RBI14)*

6.3.2.3 *Stocking Ability*

RBIs need capital and warehousing facilities to be able to stock NR, as shown in Figure 6.7. This section shows how these two factors impact upon their decisions in PRM.

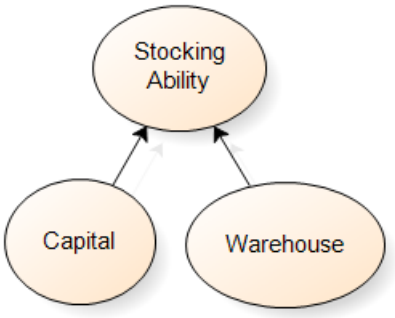


Figure 6.7: The final template of the stocking ability factor

- **Capital**

Capital is one of the key factors in risk-taking decisions for RBIs in NR business, especially for storable NR products such as USS, RSS, and cup lump. Under volatile price conditions, more available capital may lead to better opportunities for business to prosper, or simply to survive. A salient example of this comes during periods of upward price trends. RBIs rely heavily on capital to make a substantial profit. A Latex-USS RBI stated that:

> *"During periods of prices rising continuously, I need capital to stock it. If there is price uptrend, you do not need brain power, instead you need money power. For example, if you have enough capital, instead of selling after ten days, after processing, you can stock it and use your available money to buy more. You will*

make more profits from it because the price will go up. You can stock today's rubber and sell it whenever you want. During periods of uptrend in price it is easy to manage the business." (RBI16)

- **Warehouse**

In addition to capital, RBIs require warehouse facilities to stock their products. The available capacity has a direct impact on the volume of products that can be kept. As a consequence, capacity has consequences for the size of risk an RBI could take by holding stock. Moreover, RBIs can also make use of their partners' warehouse facilities to stock their rubber, rather than their own. One RBI explained:

> *"A warehouse is important. My shop is too small; so, I mostly stock it [NR product] at processors' warehouses. I can sell it on consignment for a month if I don't request any payment. If I request part payment, I can stock it for 7–15 days. Unlike mine, big shop will have a big warehouse. … Warehousing certainly affects my decisions in risk taking because when price is in the uptrend we will get nothing from that opportunity if I cannot stock it [NR product]. This is the reason that why I prefer downtrend price as my shop is small. If I am convenient to stock it, I can speculate more." (RBI18)*

Another RBI revealed how he uses stocking for a speculative purpose, maintaining the balance of NR supply and facilitating trading. He mentioned that:

> *"I can stock it [NR product] for 300,000 to 400,000 kgs. If I think prices will rise I will stock it all. Moreover, in periods of high rubber supply, they are at full capacity in processors' warehouses. As a result, a processor may offer to buy my rubber at discount prices. So, I have to stock it in my own warehouse. This also requires capital, if you want to stock for speculation. Sometimes, even though I have sold it to processors in advance, they may suspend my delivery if their warehouse is full." (RBI20)*

Furthermore, in order to help RBIs in managing risk, they need appropriate warehouse facilities to maintain the quality of NR products. RBI12 added that:

> *"I am convenient in stocking i.e. it is convenient for me to hold stock for speculation because I have my own warehouse. … The warehouse will protect it from sunlight and moisture from the rain. If I don't have suitable warehouse facilities available to store it, rubber will become lower grade, for example, by becoming too dried. So, I have to hurry to resell it in that case." (RBI12)*

6.3.2.4 *Hedging Ability*

One of the obvious factors that influence RBIs in risk-taking decisions is the lack of availability of PRM tools. In such circumstances they have little choice but to accept risk. This section is about RBIs' ability to hedge against price risks and their decisions.

- **Accessibility of Price Risk Management Instruments**

Under some circumstances, though RBIs do not intend to take risk, they are unable to transfer it to others. They require RPM instruments to do so. It is unsurprising that some of them at times, cannot use the instruments they require to manage risk. This may be because such PRM instruments cannot be accessed, or because of malfunctions during periods of price volatility. One RBI expressed:

> *"I don't want to take risk, but I couldn't sell it." (RBI22)*

6.3.2.5 *Business Environment*

The highly competitive circumstances created by the NR market forces some RBIs to take greater price risks they would like to. The majority of RBIs who participated in this research mentioned this point.

- **Competition**

Competition amongst RBIs in the market is one of the main factors influencing decisions to take higher price risk. To gain market competitiveness, RBIs sometimes have to buy NR products from suppliers at above market prices. This may lead them to sustain losses as a result. Although they know that they are at risk of losses, they accept such risks for the sake of business survival. One RBI stated that:

> *"When it is a period of high competition, I have to buy it [NR product] at higher prices than I can sell. When I buy at such high prices, if I resell quickly, I will get losses. So, I have to stock it, though sometimes I should not do so. If I sell, I will make a loss. As a result, I have to take risks, and mostly I will lose. It is the most headache-causing problem. For example, although I beat my competitor, I will be weakened by the competition. Then, it will be the number two and then the number three in the queue. Sometimes, there were even three new shops open at the same time." (RBI11)*

Competition is not equal everywhere. Some locations show less market tension than others. However, there are places where competition is unavoidable, such as those areas where many RBIs' shops are situated close together.

> *"There is competition in business, but it depends on the location. Farmers compare buying prices between merchants [RBIs]. However, in my area, there are a variety of rubber grades produced; so, it is difficult to [make them] comparable. … There is high competition in the areas in which there are many shops close to each other." (RBI11)*

One of the reasons for high competition is that some RBIs use the expected future price in their pricing method. For example:

> *"It [the market] is highly competitive when prices are stable. Nowadays, rubber traders have to buy it [NR product] at the price processors offer, and rely highly on speculation. It is not the case of that the processor offer 73 Baht/kg and I can buy it at 71 with 2 Baht as a margin. Actually, I sometimes have to buy it at 73 or 73.50 because I may sell it at 75 if I am successful in speculation." (RBI20)*

6.3.2.6 *Business Partners*

The decisions of partner suppliers and buyers impact on RBIs' business (as shown in Figure 6.8 below), since they play a role in the connection of the two. Suppliers' selling decisions affect the volume of RBIs' supply, while buyers' decisions may influence their buying or even market prices.

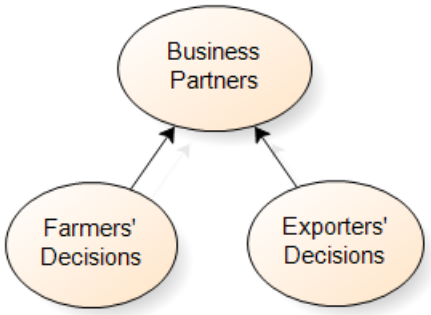


Figure 6.8: The final template of the business partner factor

- **Suppliers' Selling Decisions**

RBIs make marketing decisions based on the volume of NR available to buy. As well as the effects of the seasons and weather on NR production volume, the effects of farmers or small RBIs' decisions to sell their products are important. They are able to hold NR stock for a significant period of time. Thus, RBIs have to understand their business suppliers' decision behaviours. RBI23 explained that:

> *"If prices are low, I will buy rubber from farmers and stock it. Then, when prices are higher, I will resell it. However, now, some farmers are clever. They stock it [their product] when prices are low, and they will sell at high prices. For example, they sell to me at 80 Baht/kg. When I resell it to the auction market, the price goes down. I will not make profits. Instead, I immediately sustain losses. It seems like taking an advantage of merchants [RBIs]. Some farmers are smart, and they also have capital." (RBI23)*

Regarding suppliers' stocking capability, there are two categories of NR farmers: the farmers who are highly dependent on NR income and those who are not. Another RBI mentioned:

> *"Farmers can be divided into two groups. There is the rich farmer, who owns big rubber plantations. They can suspend rubber tapping periods. For instance, they can wait for high prices before they start tapping it. In addition, they can stock their rubber which they have produced in their warehouse, and are looking for higher prices. The other group is made up of the poor farmer who needs to keep producing in order to sell their product for a living." (RBI12)*

- **Exporters' Decisions**

With regard to the power of the exporter in domestic NR prices, forward contracts management strategies are significant. RBIs believe that exporters have some level of price influences. Therefore, they try to follow the exporters' decisions as they think they may receive an advantage from it. One RBI revealed that:

> *"Previously, it was relevant to quarterly. … They will sign the contracts around three months in advance of the delivery date. So, if as in my experience there will be plenty of rubber supplies in June, processors will use this opportunity to discount prices as they sign the contracts. … This is the trading behaviour of processors. However, rubber supply is not always predictable. So, in July they have two alternative choices. If there is sufficient supply, they will keep offering the discount price as planned. Conversely, if there is a shortfall of supply, they may offer a higher price in order to compete for raw material required to deliver the contract." (RBI11)*

RBI24 explained how exporters may influence the NR price movement in their favour.

> *"Many big processors trade in futures markets. For example, they will manipulate the price until it increases to 80 Baht/kg and then start selling from 80 to dump the price down. So, they can buy rubber in physical market at just 60 [Baht/kg] to process it for delivery at the price of 80 [Baht/kg]. They could make 20 Baht/kg in profit." (RBI24)*

Exporters sometimes make bad marketing decisions, and these have an impact on the domestic market. This is because the subsequent action to correct decisions will impact the price in their favour.

> *"I think the actual cause of low prices is the discount of offered prices by processors. This occurs because previously they have been mismanaged at high prices. So, they buy at discount price to lower the average price in stock. … So, when they sell the stock, they will not make losses." (RBI01)*

Some RBIs believe that their business partners' decisions will provide benefits to them if they are made well. Therefore, reliance on them is a good option. For example:

> *"Most processors are also exporters. So, they have their own markets to export to. Each exporter has each own market. Each market has different demand, which means differences in offered prices. As a result, sometimes processors offer me a high price. I make greater profits from this." (RBI03)*

6.3.2.7 *Financial Situation*

Financial constraints also influence risk-taking behaviours. Three factors involved in risk management decisions, levels of debt, loan and alternative sources of income (see Figure 6.9), are presented in the subsection.

- **Debt**

Many RBIs have invested in the infrastructure to trade NR product. Therefore they have some debt to service. As a consequence, they have to keep operating the business even when market competition is high, which, in turn, leads to high price risk exposures.

> *"It is very highly competitive in the market now. Some of them [RBIs] admit to accepting loss in order to retain customers. They don't want to lose customers but accept losing money. I have to take risk as I invested in infrastructure, such as lorries, for several million Baht. Previously, I could make profits of 200,000 Baht a month, now I get just 10,000 or 20,000 if I am lucky. It is just enough to feed my children." (RBI01)*

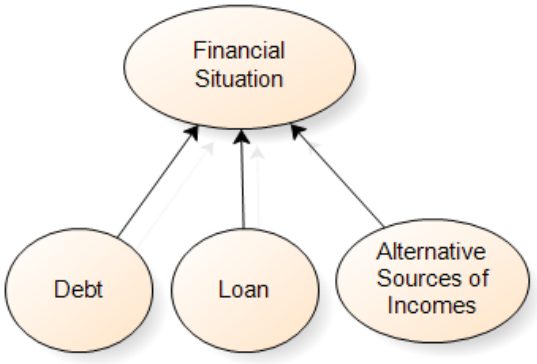


Figure 6.9: The final template of the financial situation factor

- **Loan**

In the NR market, not only are RBIs in debt as a result of borrowing money from financial institutions, but they also subsidise their NR suppliers by providing loans. However, this kind of loan is usually unofficial. As a consequence, some of RBIs are reluctant to take a

risk in order to keep in contact with their borrowers to ensure payback. An RBI who provided a loan to her suppliers expressed it as follows:

> *"Some of them [Tier 2 latex RBIs] borrowed money from me as they do not have enough to cover their payments, for example for a pickup car installment payment. So, if I stop operating my business because it is too risky, I will lose what I have lent them. This commonly occurs in the case of most latex merchants [Tier 1 latex RBIs]. We need to support them." (RBI01)*

- **Alternative Sources of Incomes**

Alternative income makes RBIs avoid taking high price risks when the market is uncertain. Those of them who have an alternative way to generate income do not take risk when they think it too high. They are satisfied to secure their investment. One RBI who owns an NR plantation stated that:

> *"I don't like the high risk business. In recent years, the market has been too volatile. It is not worth doing it. Today, I can stay in the business because I own a rubber plantation." (RBI20)*

6.3.2.8 *Business Performance*

There are three business performance measurement factors involved in risk taking decisions, as presented in Figure 6.10. Firstly, past performance is from the results of previous decisions. Secondly, current market performance is measured from stocks held relative to market prices. Finally, the future performance of market positions relative to price trends. Below are more details.

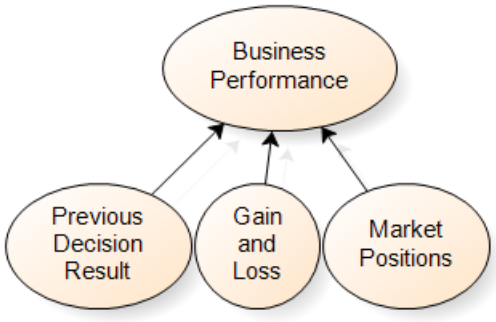


Figure 6.10: The final template of the business performance factor

- **Previous Decision Result**

Trading in rubber is an iterative task by nature. RBIs have to make decisions on a daily basis. Negative results from previous decisions do not significantly impact upon

subsequent decisions. One RBI stated that even though he had made wrong decisions, they could result in new opportunities.

> *"If I counted for over 30 years of my trading, there would be over 100 times that I made losses. However, the right decisions far outnumber the wrong ones. I do not worry about it if a decision was wrong. You can do it again like traders in the stock markets, but we [RBIs] trade rubber. Markets are always there; so, if you are uncertain about the market today, you can wait for whenever you are certain. If you cannot make profits today, you will make them one day. This is because there will always be a market for the rubber produced by the farmers." (RBI07)*

Another RBI mentioned that she might repeat a decision even though the result of the previous decision was negative. The subsequent time she will make a greater effort to ensure that she will have a good result.

> *"If I get losses in previous trading, I have to try again. For example, I get losses today; tomorrow, I will do the same again. However, I will contact them processors to ask them to inspect the process in selling carefully. I will negotiate with them, arguing that as a result of their previous grading measurements, I cannot continue business with them. I have to change to other processors if a problem is repeated." (RBI03)*

Since price risks are involved in NR trading, gains and losses are common. When RBIs take losses when they are young, it may discourage them to make similar decisions again. However, as they get older, they are more tolerant of negative results and are not reluctant to make new decisions.

> *"I was impetuous in decision when I was a young, but I am calmer now. When I was a new RBI, I was enthusiastic. However, when I had done it for a period of time, I started to weaken. This is because trading in rubber markets had mixed results, both making profits and taking loses. Whenever I made losses I felt depressed, discouraged; but as I got older I could deal with it." (RBI15, 44 years old)*

- **Gains and Losses from Physical Holding**

Though market movement is the major factor impacting upon RBIs' marketing decisions, they tend not to accept losses from unfavourable market price movement. They consider whether the market will change direction. Therefore, they will ultimately ensure a positive result.

> *"In trading, making losses is unacceptable. I can say that I am trying to avoid losses as much as possible." (RBI10)*

There is additional evidence that RBIs avoid selling their holding products at losses. For example:

"Decreasing prices have the result that I am forced to stock it [NR product]. Sometimes, when the price is low for a long time, I am forced to stock longer than usual. If I decide to sell, I will make a loss. So it can take long time before I can sell my stock without losses." (RBI06)

- **Gains and Losses from Market Positions**

Sometimes, RBIs had already made a decision based on a previous one. In the event of a change of price trend in the market, RBIs have to make a decision whether to reduce, retain or increase risks.

"My market position has to be considered before making a decision. My position may be either holding stocks or having forward contracts. I have to manage the state of my market position at first." (RBI16)

RBI11 mentioned how he manages business when his previous action did not work well.

"At times I have sold in advance when I thought it the price would decrease. I thought that the price would go down but in fact it did not. Prices may gradually decline. However, I cannot make profits from that decision. I have two choices to be considered. The first is to deliver what I bought, or if I believe in my information I have to wait and sell what I bought to other market first." (RBI11)

Additionally, big RBIs may help their suppliers to reduce risks when their decisions turn bad. The response to earlier decisions can be important when market prices change or move in an unexpected direction.

"If my customers' decisions go wrong, I have to source product from other places to offset the position in order to reduce risks. My customers have to deliver goods to us where there are no time limits, but I will ask them to deliver as soon as possible. However, if I think that the price will increase further, for example ten Baht more, I will buy for them from auction markets to close the position. Then I will invoice them for the operational costs." (RBI14, one of large RBIs)

6.3.2.9 *Personal Profile*

There are three factors relevant to the profiles of research participants that influenced decisions in risk taking. They are age, NR trading experience, and attitude toward price movement direction (see Figure 6.11).

- **Age**

Some participants who were older and had a greater number of years of business experience provided information about the differences in their risk-taking behaviour at different ages. They were likely to take risk regardless of consequences when they were

young. However, as they got older, they tended to consider risk more carefully before making decisions. One of the older RBIs stated that:

> *"The older you are, the more firmly you make decisions. The young sometimes rush to make a decision but the old tend to be thoughtful." (RBI19, 56 years old)*

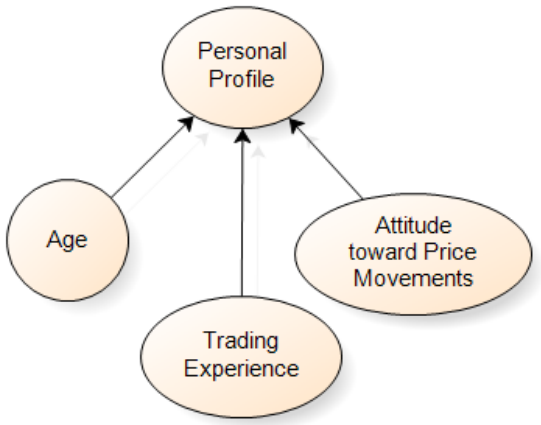


Figure 6.11: The final template of the personal profile factor

Another older RBI mentioned that he could accept losses from his decisions because price risks are an unavoidable part of the nature of NR trading business.

> *"I am old; so, I avoid tension. If I lose I can admit it, and go on looking for the next trade. Other traders may hold stock that has already [made] losses, like for a million Baht, and they are afraid to sell it. They think that if they don't sell it now. They will eventually made a profit when it is sold." (RBI07, 58 years old)*

One RBI revealed that he could not take high risks as he got older. However, he was able to admit the negative results of his decisions.

> *"I am firmer in my decision making, but at the same time I don't want to take high risk as I get older. I am now not ready to take high risks, to invest all that I have to compete against others. Ten years ago I was ready to do that but I am not now. Unlike before, I dare to make decisions, but I'm not bold enough to take high risk." (RBI11, 38 years old)*

- **Trading Experience**

Some RBIs argue that, rather than age, it is their trading experience which helps them to make decisions in risk taking. Although price movement is difficult to forecast, when a trader gains enough experience, their ability to analyse the market will improve. As a consequence, they can rely upon their experience in making decisions. RBI14 stated that:

"My risk-taking decisions depend on my experience rather than age. This is because a rubber trader is like a pilot. ... Trading rubber depends on trading experience. For instance, if you have traded for more than a price life cycle, such as ten years, then you have seen the price reach the top and fall down to the bottom. As a result, you gain experience to be able to understand the market." (RBI14)

Another RBI added that greater trading experience can lead an RBI to take higher risk, regardless of age. This is because they can recognise the opportunities to make profits rather than relying on luck. Moreover, an experienced RBI may have access to greater resources, and so be ready to take higher risk, as a risk taking strategy requires more resources to implement and to compensate against it in case of losses.

"When I was 25 I may not have dared to take high risks because I had limited resource and lack of experience. However, when I was 35, I started being capable of greater foresight and more thoughtful; so, I was keen to take higher risk. This is because I understand risk and the probabilities of risks I take. It isn't gambling like a coin toss. I take the risks that I have experience of. For example, if I know for sure that prices are going to increase, I will stock rubber." (RBI09)

- **Attitude toward Price Movements**

Some RBIs think that to survive in a period of NR price fluctuation, they need to follow the market whether it moves up or down. In such cases RBIs need to use PRM instruments to help them, particularly when prices fall. Even though RBIs are used to making profits from stocking and are waiting for price rises, they need to use forward contracts when they think the price will drop. RBI07 reflected that:

"To be a rubber merchant, you have to know how to analyse the market, know how to trade in forward contracts. It is not necessary to have increasing prices to make profits, decreasing prices can make them as well." (RBI07)

Nonetheless, another RBI argued that using forward contracts, on some occasions, will make the price decline more. As he worked close to NR farmers who rely heavily on rubber as their main revenue, he experienced negative impacts on their children from low prices. He revealed that:

"I am primarily aware of our community. When I consider the community, I notice that many merchants sell in advance to processors though prices are quite lows, I question that why they still sell it. They shouldn't sell, because if they don't sell the processors will not offer lower prices. However, I can do nothing." (RBI13)

Conversely, some RBIs depend on forward contracts to utilise their limited resources and make greater profit margins. They usually have more market power during price downtrends then uptrends. Another RBI explained that:

> *"I like it when prices are in downtrend because I use less capital in trading. If I stock rubber for 100,000 kgs at the price of 100 Baht/kg, I have to spend ten million Baht. By contrast, if I sell it in forward contracts for the same amount of rubber, I will use just one million Baht. … Moreover, when prices are in downtrends, I can easily trade with my suppliers. It is the opposite when prices are going up, because they usually ask for higher selling prices." (RBI17)*

6.4 Market Channel Selection

Market channel selection is another crucial activity that RBIs contribute to the NR supply chains in terms of collecting points, and matching the products and requirements of the NR grades, and enhancing the efficiency of the NR supply chain. Regarding the range of grades with regard to NR products that are mostly produced by small, family-owned NR plantations, procurement of a particular grade of NR products by exporters is considered a challenging task. It is clearly evident that RBIs serve this need as part of the supply chain, and allow the NR users to get what they need from small NR volumes and varying NR product grades from a range of production points. Moreover, they make the supply chain efficient as they seem to keep selecting market channels that lead to good profits after meeting operational costs, including transportation costs. This section investigates how RBIs choose market channels from the alternative choices. There are seven factors relevant to decision making with regard to selecting market channels to sell NR products, as shown in Figure 6.12.

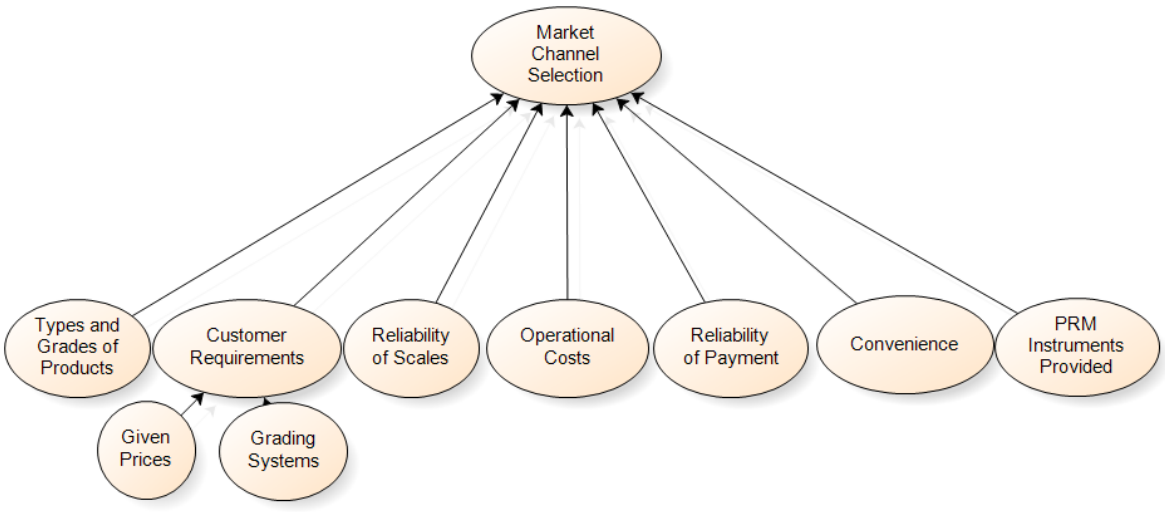


Figure 6.12: The final template of market channel selection

6.4.1 Types and Grades of Products

Since NR production is based on individual farmer's decision, the grades of NR products sold to RBIs vary. This is common in all types of NR products: latex, USS and cup lump, all of which RBIs buy. They then resell some of them as the original NR products they bought, namely latex, USS and cup lump, while some of them are sold as subsequent products in the form of USS and RSS produced from latex. In order to maintain competitiveness by gaining as large profits as possible, RBI decide on the market channel they are going to use to sell the product based on the NR grades they sourced. One USS RBI supported that outbound grading which is later relevant to market channel selection, is the value added activity.

> *"Regarding rubber sheets I buy, I sell the majority – I can say 50% of it - to processor A. Another 40% is sold to processor B. The remaining 10% I sell to processor C. This is because of the need to match the rubber grade I have bought to the grades that the processors offer high prices for." (RBI09)*

A scientific method of measuring the DRC of latex is highly reliable relative to the cup lump and USS grading systems. Moreover, latex has to be measured using some chemical properties when it comes to grading. As a result, if it does not meet the required criteria, the latex will be bought at a discount. One of the latex RBIs stated that, in addition to measuring the DRC in NR products, latex requires some chemical property testing in order to grade it.

> *"Unlike cup lump or rubber sheets in which the quality is identified by moisture measurement, latex needs more measurements. It needs to be mixed with some chemicals to preserve it. Cup lump doesn't need to be preserved. As far as rubber sheets are concerned, it is already dry, so it can be stocked for months before reselling it." (RBI03)*

6.4.2 Customer Requirements

The customer requirement factor is important to business decisions. Especially in NR trading, the right customer means a high profit. In NR trading, choosing the right buyer to maximise profit is not easy, as the grading of USS and RSS is done by sight and this provides some window of error in terms of measurement when it comes to slightly different grades. A USS RBI revealed the selling price mechanism relevant to the offered buying prices and the DRC grading system as follows:

> *"DRC is the percentage of rubber dry content. That is a rubber sheet grade. For example, in this period, there is a low supply. Processors set higher buying prices but the uncertainty is the percentage of rubber content. If they really want raw*

materials, they will grade my product properly. However, sometimes, they offer a high price but then they discount my rubber grade." (RBI11)

RBI07 explained how he knows his customer's demand. He explained it as follows:

"I have to calculate which buyer will give me the highest price. For me the transport costs are similar for every buyer. So, firstly, I consider their offered prices which are sometimes different. Secondly, the graders of the different buyers grade my rubber sheets differently. For example, one grader may grade it as having a moisture content of 3% while another may grade it as 3.2%. It depends on their policy." (RBI07)

6.4.2.1 *Given Prices*

Price is vital in rubber trading, as it is an easy benchmark on which to make a decision. In a business in which the grading system is reliable such as with latex, price is a deciding factor in marketing the product. Therefore, price seeking or negotiation is common in latex trading. A latex RBI described that:

"Mainly, now I attempt to search for the best price. I sell it [latex] to many processors, not just only one processor. I have a regular business partner but they may not be able export it because they have no orders. They explain to me that the market demand has decreased. … Now, I have to sell anywhere. I even used to go to Hat Yai or Rayong. I transported it from Surat Thani to Rayong [it is a long way from these two locations]." (RBI03)

In contrast, price is the key determinant of RBI customers when it comes to choosing amongst them as well, even though it should actually be related to not just price, but also DRC and weight.

"The key point with regard to attracting customers is price. For example, farmers will ask why other RBIs buy at a higher price and why do I not buy at the same price? However, they consider just prices, regardless of grading and weighting systems." (RBI04)

Even with an RBI who has just a single business partner, price is a sensitive factor in his competiveness. Therefore, he will negotiate with his buyer if he finds that the offered price was not right by comparing it with other buyers' offers.

"I have to consider every processor's offer price, though I have only one business partner. I have to study whether their prices are similar." (RBI05)

6.4.2.2 *Grading Systems*

The grading system is big issue in the cup lump industry. It is unsurprising that selecting the right processor is even more important than those related to USS since there is a

wider gap in grading which, in turn, results in a significant difference in gross selling prices. One of the cup lump RBIs explained that:

> *"Cup lump will lose more moisture when it is stocked for a longer time." So, we need to select processors when we sell it. Some processors don't like cup lump that is too dry. They will grade it lower than it should be. However, some processors like dried cup lump, and they will grade it higher. … So, I need to choose the right processor to sell my graded product." (RBI12)*

RBI09 reduces grading system risks and other risks by selling his cup lump to a Tier 1 cup lump RBI.

> *"For cup lump products, a large-size merchant will come to buy at my shop. In this area, RBIs mostly sell to large RBIs. Because, like I mentioned before with regard to the grading system, either I sell it directly to processors or to large-size RBIs. As a result, I will receive similar payment. … Moreover, if I sell to them at my shop, I will use my scales to weight it." (RBI09)*

6.4.3 Reliability of Scales

Weight measurement is another important factor that influences the decision in terms of selling. It directly affects the final trading result, and it has a similar impact on every NR product traded. One of the USS RBIs commented that:

> *"It is the issue of scale that is the standard of weight measurement. … It includes many factors. For example, the pallets can be incomplete. The factory may have been established for 20 years. Originally, some of them were marked as 100 kgs in weight and some as 50. With time passing, some of their parts were lost but it they may still use the 50 or 100 as its weight. I argued with them several times, but they have still done nothing. So, I think it is a small risk that I have to be exposed to. However, I can estimate it in advance to make the decision about selling." (RBI07)*

6.4.4 Operational Costs

In trading NR, several types of operational costs such as effort, finance, logistics and management costs are relevant. For example:

> *"We have labour costs, loan interest, goods transportation and my labour for management. Moreover, we have to pay tax as well. These are the operational costs for the RBI business." (RBI17)*

Some of operational costs are sensitive to the market channel that RBIs have chosen to market their NR, especially, their transport costs.

"After I compare who offers me the best price, I consider the distance between my shop and the buyers' location. I have to consider it as a part of my decision because a closer buyer means that I can save in fuel costs." (RBI07)

6.4.5 Reliability of Payment

Counterparty risks are well-known in NR trading. The nature of the small margin in RBI business from the competitive market leads to their trading behaviours being sensitive to price. However, their trading is likely to rely on an informal way of doing business. This includes verbal forward contracts and the payment methods used. Although, trading NR is a cash business in that they exchange NR products for cash immediately, sometimes it is unavoidable for them to have to accept delayed payment. As a consequence, this may lead to a payment default. Therefore, the payment method is one of the factors that influence RBIs in terms of market channel selection. An RBI revealed his experience of counterparty risk by stating that:

"We have to choose our business partner in terms of risk. For instance, A and I have never traded before, but my friend recommended him to me because he had traded with A and A always gave him good prices. I contacted A to check the situation and he offered me 2 Baht above what I could sell for elsewhere. … Unfortunately, A paid to me for just four of them. A has the problem of mismanagement in his forward contracts with processors. A suffered huge loss. So, A could not pay me for the rest. It is a big problem in the industry." (RBI17)

6.4.6 Convenience

One of the issues that big RBIs face is that of a bottleneck problem with regard to NR delivery when they resell to processors. The processor may have a limited capacity in terms of labour to unload it. Therefore, the RBI may decide to distribute their selling of NR to many processors so that the delivery of goods is more convenient. One big RBI explained it as follows:

"I have to manage our goods so there is not congestion in just one place. For example, if we have high volume of NR products, when we deliver it there is a problem of unloading the goods. If we deliver ten full lorries to just one processor, their labour force cannot unload it within a day. So, we have to distribute it to several processors in order to operate it more easily. If we deliver all ten lorries to a single place, it is difficult." (RBI14)

Some of RBIs decide to sell their NR products through other market channels, although the auction markets offer the best prices. This is because of the limited resources the auction market has to provide a service for RBIs. One RBI revealed his experience as follows:

"The auction market is a good channel to sell my products [RSS]. I can go there but it is far. If I sell to the Jandee [Nakhon Si Thammarat] auction market, I cannot deal with it because I have to keep buying latex to be processed here. Moreover, it is an issue of transportation as well. For example, previously, I sold my NR to the Surat Thani auction market. At this time [in the afternoon], I was preparing for delivery and I was leaving around 4 AM for the market." (RBI24)

6.4.7 Price Risk Management Instruments Provided

The hedging service provided is another factor that influences RBI when it comes to choosing buyers. Some NR businesses are aware of the availability of PRM tools when they really need them. Therefore, to make sure that they can use it, some of them decided to sell to buyers who can help them hedge later. An USS RBI explained:

"In the last two or three years I have found that I cannot sell to just a single buyer; because there is a high risk that one day, if I want to sell NR in advance, they may not allow me to do it, and I will have no other option. This is because if I have not traded with them before, and they will not trust me to have an advance contract. So, I attempt to supply many large-size RBIs and have transactions with them regularly by dividing my NR into smaller lots. As a result, I will have choices if one of them does not allow me to sell in advance when prices are volatile." (RBI21)

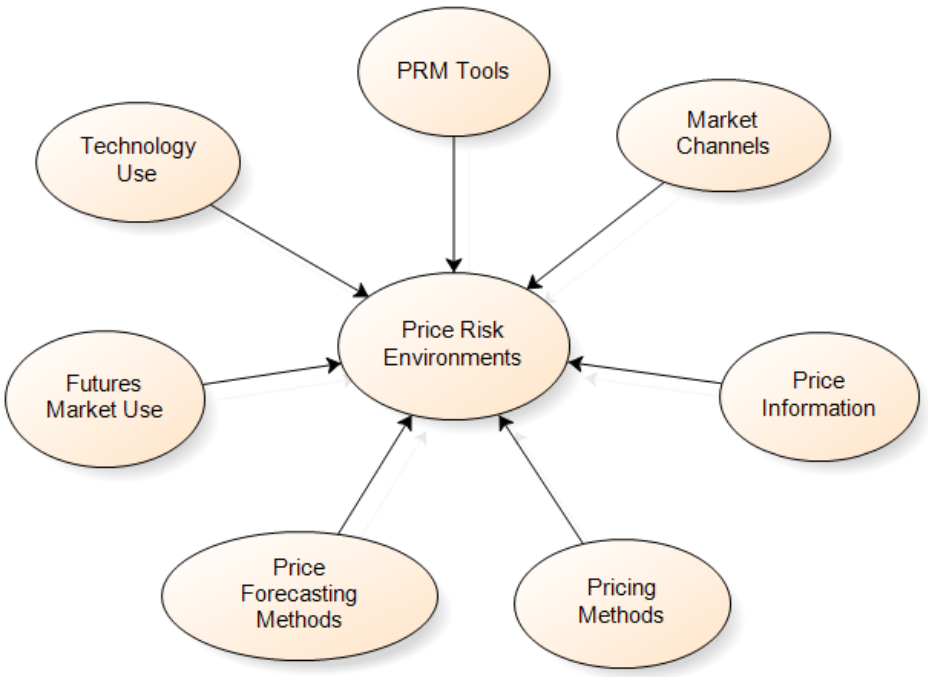


Figure 6.13: The final template of price risk environments

6.5 Price Risk Environments

This section presents price risk environments in terms of PRM instruments, market channel, price information, pricing and price forecasting methods, and futures market and technology use, as shown in Figure 6.13. PRM instruments play a vital role in NR intermediary businesses as they have a tendency to link to business performance, particularly during the periods of price downtrends or volatilities. This research also studied the market channels available for RBIs in marketing NR products traded. Furthermore, the issues around NR prices, in terms of how RBIs gain and exchange price information and what pricing and price forecasting methods RBIs used, were investigated. Finally, the ways how RBIs use futures markets and technology were examined. The further details follow below.

6.5.1 Price Risk Management Instruments

At the core of trading management with price risk circumstances, RBIs need PRM tools to deal with them. There are four main kinds of PRM instruments that are commonly used by RBIs: cash market, stocking at own or business partners' warehouses, forward contract with business partners or via auction markets and using futures markets for hedging (see Figure 6.14). The details of each instrument are as follows.

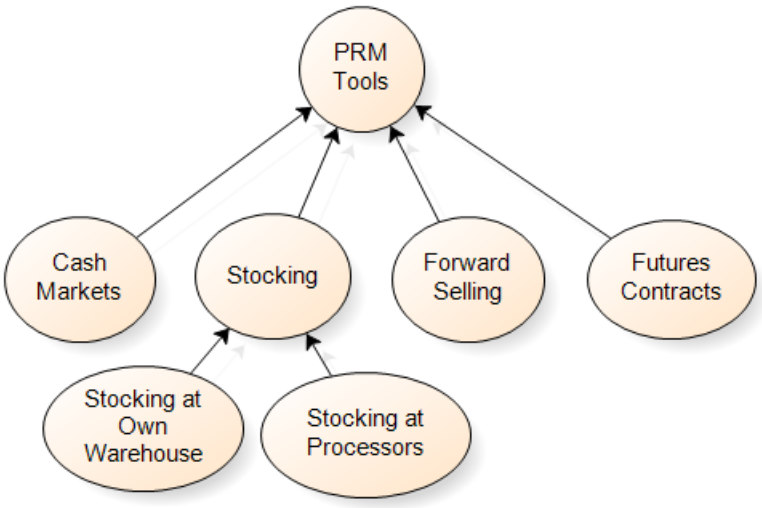


Figure 6.14: The final template of PRM instruments

6.5.1.1 *Cash Markets*

The most simple and accessible tool in PRM is the cash or spot market. The mechanism is modest to exchange cash for physical goods. The cash market does not require

market power or trading relationships. As a result, it can be participated in by a novice or small RBIs, or even experienced ones who enjoy back-to-back selling. A big RBI described that processors trade with non-credit suppliers via cash markets for a while before they are able to gain credit for contracting.

> *"Trading in cash is the way to exchange rubber for cash. Customers will get the value of what they deliver to us. They don't have to arrange forward contracts amongst themselves." (RBI14)*

Trading in the cash market may provide an advantage from using other types of PRM tool in premium prices. RBI21 described:

> *"Processor A offered 100 Baht/kg for cash market prices. However, it provided buying prices of just 98 for NR sold on consignment. So, the price in the cash market was higher. Some RBIs who had not stocked at the processor's warehouse had an offer of 100 or even 101 Baht/kg." (RBI21)*

6.5.1.2 *Stocking*

There were two types of stocking implemented by RBIs. They were stocking at their own warehouses and also stocking them at those of processors (selling their products on consignment).

RBIs need warehouses as an infrastructure to gain capability in stocking. One of their alternatives is building their own warehouses.

> *"A good point for RBIs is that if we [RBIs] have enough capital, we can stock NR for selling later at higher prices. On the other hand, if the price is too high, we can sell it in advance, and then we can buy it later or deliver. Unlike stocks in the financial market, we have to buy it first and sell it later." (RBI15)*

Another choice is to stock at processors' warehouses.

> *"I stock them [NR products] at my own warehouse or at processors. However, the majority of them are stocked at my warehouse." (RBI20)*

Individual NR products required different types of storage and their capability to be stocked was different. Although latex is an unlikely stocked product, it can be preserved with the proper containers. A latex RBI said that:

> *"Latex has to be stocked in a place where sunlight cannot reach it as it will be degraded quickly. I have tanks buried underground. I have to add some chemical and keep it in the underground tanks. I also have wells made of cement with the surface fitted with ceramics. … In addition, it can be stocked in the tank on the lorry. Sometimes I need to stock the latex. I can stock 10,000 kgs in the cement*

well, 15,000 kgs in the underground tank and the rest I will stock it in the lorry's tank." (RBI03)

Stocking at processors was understood in terms of selling on consignment. An RBI explained that:

> *"Selling on consignment means we deliver NR products to processors without identifying the selling prices. However, processors can see it from accounting. … they may offer lower buying prices. They may wait until an RBI panics and sells all of the stocks. When all stocks are sold to processors, for instance in the morning, they might offer buying prices higher by 0.50 Baht in the afternoon. They do it like this for us on many occasions." (RBI12)*

Although stocking at the warehouses of business partners is convenient, RBIs may lose market power to negotiate with them since processors have already received the raw material. Therefore, RBIs are unable to change to other buyers. One RBI, experienced in using the service, revealed that:

> *"In the periods of good prices [prices going up], I stocked it at my shop. Even though I have to use a high level of capital and some equipment to stock it, I can make profits. I rarely stocked it at processors because I had a bad experience from doing that during the periods of high prices. It taught me a lot." (RBI21)*

However, selling on consignment was considered as a supplementary service for satisfying RBIs' requirements. There was no standard of agreements of selling on consignment from different buyers.

> *"Selling NR on consignment is delivering NR to processors and recording its weight without payments. They will pay us for it whenever we accept the prices they offer. However, some buyers pay 70% of their current value first and pay the rest later; but we have to sell it within a period of 15 days. Some buyers offer longer times of stocking up to a month, but they will pay just 50%. It depends on buyers. They are differently regulated." (RBI21)*

6.5.1.3 *Forward Contracts*

Forward contracts were widely used in NR trading. To facilitate physical trading, forward contracts were used as a tool to hedge the price risk of RBIs' trading. However, the contract was not arranged in a formal way. It was instead by verbal agreement. RBI10 revealed that:

> *"In NR trading, we prefer to use the credit of a verbal agreement. It will end at the conversation; for example, if you want to sell it today at this price, just tell me. There is no formal contract to be signed. It is the verbal agreement and is recorded by each person. NR trading is a business where your word is very important. If there is only a single mistake, for instance, you decided to sell it in*

advance and you do not deliver it either because of shortage of supply or prices significantly increased, your career will end. You have to keep your word." (RBI10)

Some big RBIs also provide hedging services to their suppliers.

"I also buy [NR] in advance from small merchants. They sometimes sell it in advance." (RBI20)

Not only do RBIs use forward contracts for price risk hedging purposes, but they also use them for risk-taking. RBI13 commented:

"Sometimes I sell RSS in advance without holding any stocks if I think the price will drop. However, sometimes it does not decrease like I thought, So, I get losses from it. For example, I decided to sell in advance when the price was at 125 Baht/kg. Then prices kept increasing. The price was at 128 when I delivered it." (RBI13)

In addition to forward contracts offered by processors and Tier 1 RBIs, auction markets also started arranging RSS contracts for sellers and buyers. Nevertheless, they were providing lower prices for sellers compared with auction prices. One RSS RBI said:

"A forward contract is beneficial for me at some level, but its price is usually lower than that of auction markets. For example, today the auction price is at 74 Baht/kg. The prices in forward contracts are 71 or 72. They are 2 -3 Baht lower. So, this is the disadvantage of it." (RBI22)

The benefit in PRM of auction markets' RSS forward contracts was evident. Nonetheless, as they were just in the early stages of introduction, they needed to be more customised to match the processor's need. Another RSS RBI mentioned:

"I attempt to use the forward contract in the Hat Yai auction market, held every Tuesday, to manage price risk. Farmers can also sell their RSS at the price close to the auction price. … However, I have to deliver it within a week. That is the next Tuesday. On the other hand, the forward contract from processors is more flexible. I can ask them to extend it for 2 – 3 weeks. At the auction market, the delivery period is fixed; so, if you sell it and the price increases, you may have to get it at a higher price to deliver it as in the contract." (RBI22)

6.5.1.4 *Futures Contracts*

Hedging using futures markets is the method of buying or selling futures contracts to compensate for what has been bought from physical trading. One of the RBIs mentioned that he uses the futures market for hedging for the medium-term horizon of months rather than the short-term of days.

"Hedging price risk means using the futures exchange market or forward contracts of processors. Generally, in trading, I sometimes partly use the futures contracts as well as forward contracts. I use the forward contract for the short-term management such as 1 – 2 weeks or within a month. However, sometimes I need it for 2 - 3 months; so I use the futures market." (RBI20)

6.5.2 Market Channels

Market channels are the means by which NR supply chain participants trade NR products. As shown in Figure 6.15, this research has found that there are five types of market channels used for NR trading by RBIs: auction markets, selling to other RBIs, trading directly to processors, selling via government organisations and delivery against futures contracts.

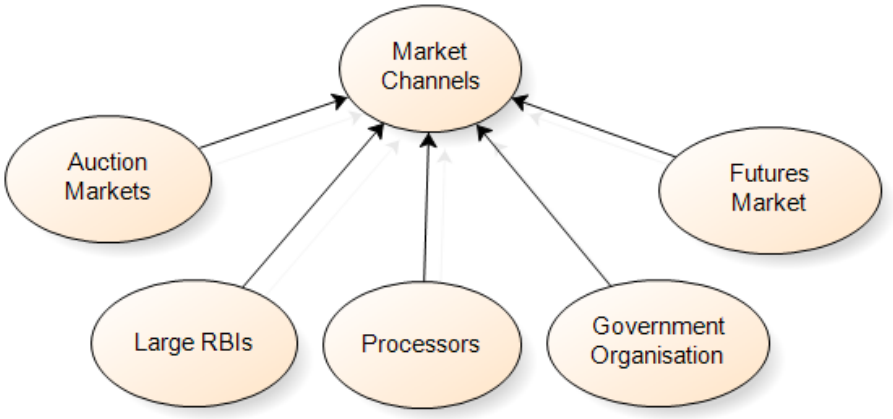


Figure 6.15: The final template of market channels

- **Auction Markets**

Firstly, central markets (also called auction markets as they use auction mechanisms in trading NR products), are well-known in the NR market in the south of Thailand. Even though this market channel usually offers better prices than other channels, it requires high quality NR products:

"Although the auction price is higher, my rubber grades don't meet its requirements. This is because the farmers produce a lower grade of rubber to sell to it." (RBI06)

and the market capacity is limited:

"There was too long a queue at the auction market. There was over capacity at the market because it has a limited number of pallets for unloading NR. I had to wait overnight to sell it the next day. So, I decided to take the easy choice by

selling to the processors. I can sell to them more conveniently than at auction markets." (RBI24)

Auction markets are considered to be the most important markets in facilitating trading activities, particularly as they provide reference prices. Not only are the prices in this market broadly known by farmers:

> *"The majority of farmers refer to auction prices as trading prices. For example, if today's auction price is 73 Bath/kg for a high quality rubber sheet grade, they will come and say to me 'Today's auction price is 73. How much are you going to buy mine for?" (RBI11)*

but they are also commonly used as the offered prices by some processors for trading in direct markets. One indicated that:

> *"You can also sell it [RSS] directly to processors rather than selling it through auction markets. However, the price you will receive is discounted by around 0.50 Bath/kg." (RBI22)*

- **Large RBIs**

Secondly, it is not unusual for NR to be traded between RBIs. There are various reasons for RBIs trading NR products amongst one another. The first obvious reason is that NR trading is considered as commodity trading with low margins but with high volume. Therefore, the economies of scale mean that the businesses gain a competitive advantage in terms of transport costs. This can be seen in latex supply chains where RBIs work as collecting points and logistics providers (see Section 4.3).

The second reason is that trading NR relies on market power. One of the ways to gain market power is to have a large volume when it comes to trading. As a result, different RBIs may receive offers at different buying prices from the same processor. Therefore, selling to other (commonly bigger) RBIs is considered a better choice for some small RBIs. Two RBIs interviewed in this study stated that:

> *"There were different sizes of RBI businesses that NR processors paid different amounts of attention to. The processors classify RBIs as the sourcing power in terms of product who could buy and deliver, such as by a pickup RBI, a six wheel truck RBI or a trailer RBI. They pay different prices depending on volume." (RBI07)*

> *"There is the grading system. They will grade me in a narrow window of 60% or 61% of net weight. It is equal to what I get when I sell directly to the processors. I do not have to concern about grading or the cost of transporting it." (RBI09)*

The third reason for this comes from the fact that some NR products such as USS, are regarded as speculative products, an example given by:

"Nowadays, the competition in the USS markets is very great. I have to buy it at the price that I can sell it to the processors, and rely mainly upon market speculation." (RBI20)

Therefore, an offered price is one of the key decisions when it comes to selecting market channels in order to sell NR. Moreover, it is not uncommon for some RBIs to offer even higher prices than those of the processors. For example:

"…they [RBIs] have the high price in forward selling at 80 Baht/kg, but the current buying prices of processors are commonly 79 Baht/kg. If I buy at 78 Baht/kg and they buy at 79.50 Baht/kg for a 0.50 profit, my customers will sell to them." (RBI21)

- **Processors**

Thirdly, direct markets involving processors are one of the most common means of trading NR as raw materials in Thailand's domestic market. It is a fact that almost all NR raw materials have to be sold to processors before they export them as semi-processed raw material products. Unsurprisingly, this market channel is considered as a main channel used by RBIs to trade their NR products, as RBIs play a role as a link between NR producers and processors. The evidence from the interview shows this:

"I sell USS directly to processors much more than to auction markets. Actually, the prices at the auction markets are better. Nevertheless, the grade of USS mostly does not meet the quality that the auction markets require." (RBI06)

- **Government Organisations**

Fourthly, it is anticipated that government organisations also play an important role as a market channel. This is because the market involves millions of small farmers. As a consequence, on some occasions, especially during low price periods, the Government may provide price support schemes in order to sustain price in the market (see Section 6.2.7).

- **Futures Market**

Finally, the fifth type of market channels that RBIs can use to trade NR products is the futures market. Some RBIs realise that they can sell a particular type of NR product (RSS3) through the futures market (the AFET). However, they insist that this market channel is impractical for RBIs as a result of its large contract size and the inconvenience of delivery. RBI11 commented that:

"I wish AFET can be practically used in managing price risk such as delivery of the physical product in my stocks. If I could deliver my rubber in stock against a future contract like that in the Singapore market, AFET would be really helpful." (RBI11)

6.5.3 Price Information

There are a number of main markets and products associated with NR trading in the NR supply chain. Their price information is shared amongst them. Price transmission amongst the market and products from the RBIs' point of view is investigated in this section. There are four main sources of NR prices and four types of NR products relevant to the RBI business. They are futures markets, FOB prices, auction markets, processors' prices and local prices related to latex, cup lump, USS and RSS products, as show in Figure 6.16. The analysis of these sources of the price information and their relevant data on websites results in the price information transmission between markets as well as products, as shown in Figure 6.17. The following subsections offer more details with regard to each of them.

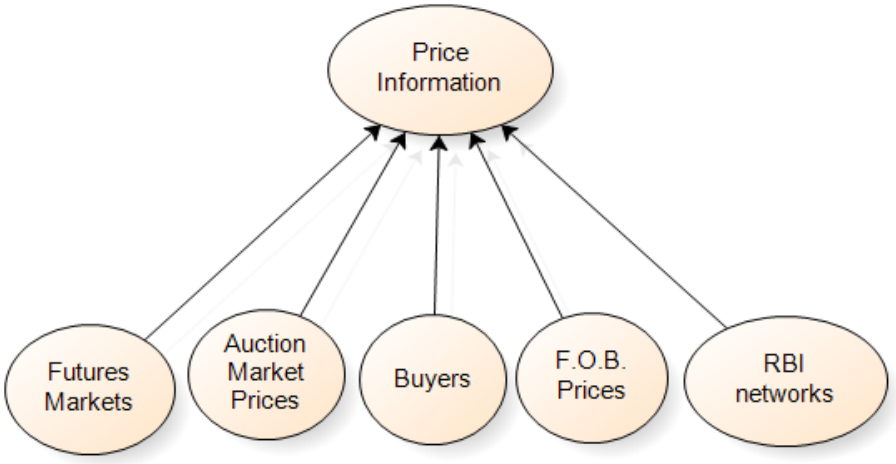


Figure 6.16: The final template of price information

6.5.3.1 *Futures Markets*

The futures market is the most important source of price information in NR trading. It is worth noting that although only there is only a single NR product in the form of grade 3 ribbed smoked sheet (or RSS3) traded in TOCOM and SHFE, all RBI types - USS, latex, cup lump, Latex-RSS and Latex-USS - use these markets for the main price movement information. Some of example comments are listed as below:

> *"After TOCOM opens at 8:00 am the Chinese market [SHFE] will open. If the Chinese market price decreases, processors offered prices will be lower as well. Processors also refer to prices in these markets. Merchants and farmers do it as well." (RBI12, who is a USS RBI)*

"NR futures market prices can be used in latex trading. For example, if rubber sheet prices rise, those of latex are likely to increase as well." (RBI03, who is a latex RBI)

"For price data for trading, I watch them in TOCOM, the Chinese market [SHFE] and SICOM. Moreover, we also receive the price trend analysis from several processors. I consider whether they have similar views." (RBI06, who is a cup lump RBI)

"If latex processors do not inform us that the buying price is lower, I will buy at the same price as yesterday. If they are working, I will include TOCOM prices at 7.00 am and the Chinese market [SHFE] at 8.00." (RBI08, who is a Latex-RSS RBI)

"I obtain price information from the general NR markets. Moreover, I also watch it on SICOM and TOCOM." (RBI16, who is a Latex-USS RBI)

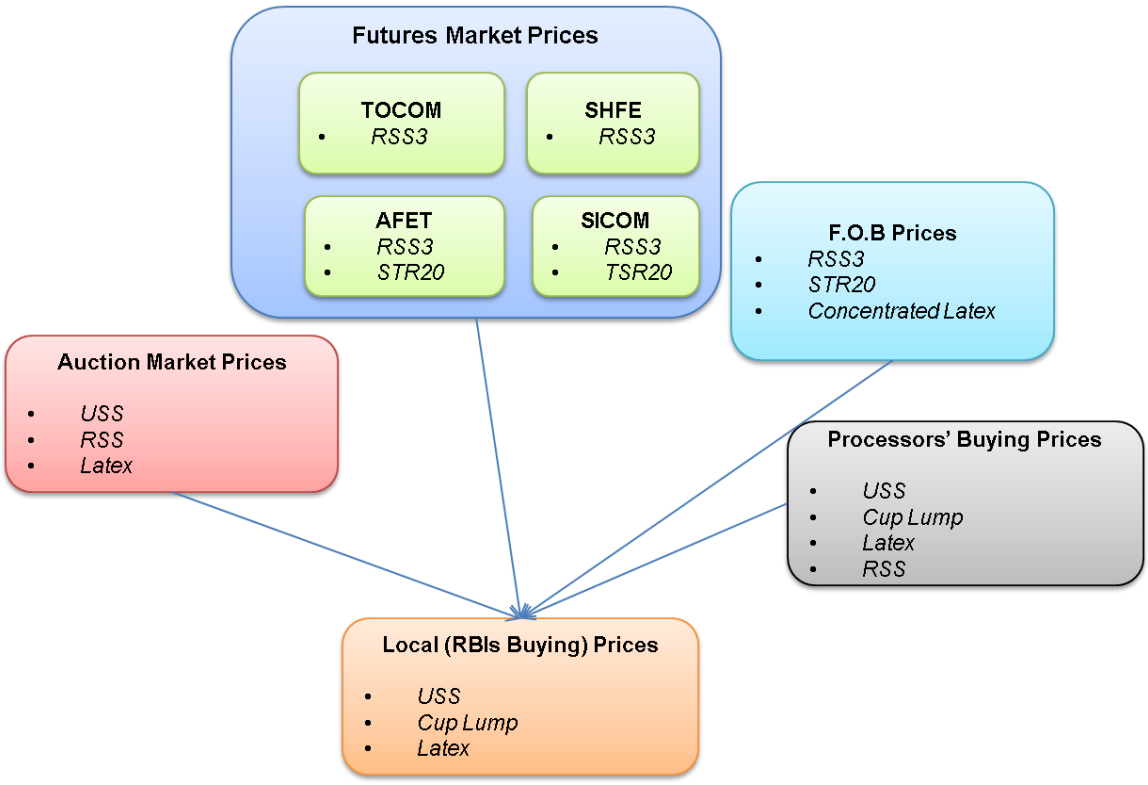


Figure 6.17: Price transmission between markets and products from RBIs' perspective

6.5.3.2 *Auction Market Prices*

Auction markets have a crucial role to play in the Thai NR market. They make the NR price mechanism more transparent. In day price in the auction markets are used widely as price benchmarks amongst NR stakeholders when it comes to trading. For example:

"I gain price information from local and auction markets." (RBI20)

6.5.3.3 *Buyers*

NR buyers, normally processors, exchanged price information with RBIs on a regular basis. One of them explained that:

> *"Most of the time my buyers co-operate with me. They inform me every afternoon. It's like being informed in advance what the price trends are going to be." (RBI03)*

Apart from processors as buyers, Tier 1 RBIs sometimes also provide price information to their suppliers as well. RBI19 said:

> *"I use the price from the processors and the big RBIs whom I trade with." (RBI19)*

Additionally, there are two Thai NR exporter associations: TRA and TLA. Both provide a price information service. A latex RBI mentioned:

> *"There is the Rubber Association. Similarly, there is the Latex Association whose website informs us of the benchmark price on a daily basis. However, actually, latex processors cannot co-operate in pricing as well." (RBI03)*

6.5.3.4 *FOB Prices*

The NR export prices or FOB prices are available on the website. Therefore, it is easy to obtain access to them. One RBI revealed that they are one of the most important price information sources in NR trading.

> *"Farmers also see TOCOM prices. Moreover, they also see the FOB price, the export price." (RBI12)*

6.5.3.5 *RBI Networks*

It is common for RBIs to form groups to exchange information and help each other. Networks were important to them in terms of gathering information used to make decisions. Moreover, sometimes they co-operate in market analysis from derived data. For example:

> *"Price information is very important. If I am uncertain, I will ring ones who know processors' insiders. They have relations working within the processors. Then, we can analyse it together. Teamwork is also important." (RBI18)*

6.5.4 Pricing Methods

Price setting associated with buying is one of the most challenging tasks facing RBIs. This is because if the price is too low they will become less competitive. On the other

hand, if it is too high, their profit margins will be thin or they may even face a loss. To set the right price, RBIs use a variety of methods (as presented in Figure 6.18) i.e. using a marginal cost base: prices from business partners, or a competitive base: futures market, or auction markets as the price benchmark, researching competitors offered prices to gain a competitive edge, exchanging pricing information within a network, or using expected price movements when making a decision. It is common for an RBI to use several types of price information in their pricing. Details of each method are as follows:

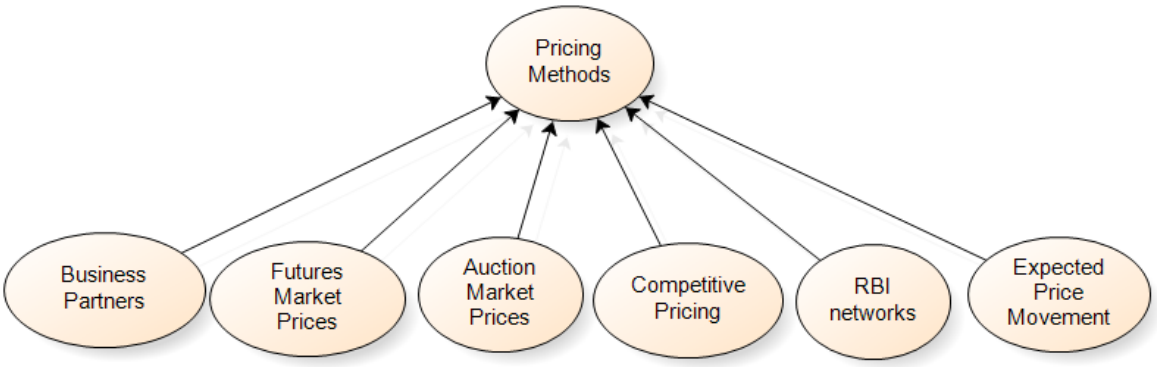


Figure 6.18: The final template of pricing methods

6.5.4.1 *Business Partners*

It is important for RBIs to set buying prices such that they can resell. Business partners' offered prices are translated into RBIs' buying prices. One RBI revealed:

> *"I decide on the price to trade with processors and big RBIs. Moreover, I have to analyse markets such as SICOM and TOCOM. Apart from these, I have to use technical graphs." (RBI16)*

6.5.4.2 *Futures Market Prices*

Apart from business partners' decision when it comes to pricing, futures market prices are important in providing the big picture with regard to the NR market. To remain competitive, RBIs require more than a single source of information when it comes to pricing.

> *"I consider the Chinese market [SHFE] and the Japanese market [TOCOM]. Then I have to see the processors' offer prices." (RBI10)*

6.5.4.3 *Auction Market Prices*

Auction prices are well-known by farmers and other NR supply chain players. It is unavoidable that RBIs' decisions with regard to pricing have to be based on them, since their prices are compared with those of the auction market. For example:

> *"I use prices in auction markets, prices offered by RBIs I trade with and processors and then incorporate them for my decisions." (RBI17)*

6.5.4.4 *Competitive Pricing*

It is obvious that the NR market is highly competitive. To remain in the market, RBIs have to offer competitive prices relative to those of their competitors. They avoid offering lower prices than the previous one as long as they can. RBI04 explained that:

> *"I may use the same price as yesterday. I set the buying price like what I could sell at yesterday. Then, I consider the competitors around me and whether they were increasing their buying." (RBI04)*

6.5.4.5 *RBI Networks*

Sometimes, to arrive at the right price, RBIs can achieve it by working together. Since pricing relies heavily upon market analysis, they exchange their opinions via the network. Eventually it results in pricing decisions. RBI18 commented:

> *"We have to help each other to analyse prices. We have to consider supply and demand, order placement. If we think prices will decrease, we will sell in advance. If it is the opposite, we will stock them. We help each other." (RBI18)*

6.5.4.6 *Expected Price Movements*

Pricing does not only rely on the current price. It also depends on prices in the future as well. This makes the pricing mechanism used by RBIs more complex. They need to offer competitive but profitable buying prices. One RBI revealed how she speculates on future prices to set her buying price.

> *"It is convenient to check the price from the website. Soon after I wake up, I open the website to see the price trends." (RBI03)*

6.5.5 Price Forecasting Methods

Expected price movements play an important role in risk-taking decisions (see also Section 6.3.2.1). Therefore, this section investigates how RBIs forecast NR prices. There are three main forecasting methods that are used by RBIs. These are qualitative

methods, financial indicators and quantitative methods, as illustrated in Figure 6.19. These are explored in more details in the following sections:

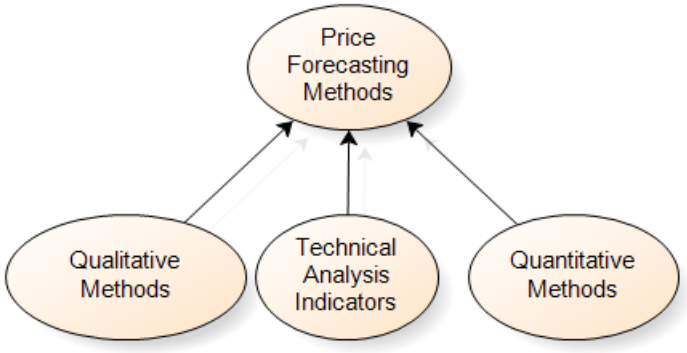


Figure 6.19: The final template of price forecasting methods

6.5.5.1 *Qualitative Methods*

Qualitative forecasting methods are widely used by RBIs. They range from fundamental analysis, to business partners, to family members, to friends, to even consulting a foretune-teller. Although fundamental analysis is important for RBIs when it comes to price forecasting, RBIs commonly consult their business partners on a regular basis, as they share some benefits of exchanging price information with supply information. For example:

> *"We [RBIs] have to foresee what the season is, or whether it will be raining, to determine what the demand is. Sometimes I have to evaluate inside news from business partners such the business partner I trade with as to a reduction in Bridgestone production. All of these make up the information that is used in speculation." (RBI20)*

Some RBIs who traded in the futures market receive price analysis from their brokers. Nevertheless, their effectiveness was still questioned.

> *"I think it needs to evaluate the price analysis of brokers from their reports for some periods of time. It needs to do both the fundamental and technical analyses. There are about 10 brokers; so, it will be just over 20 pages a day. It should be done for a year to see if the results whether are right or wrong. As a result, we will know which reports are effective and then we can then choose the effective ones." (RBI22)*

RBI16 revealed that he consulted several friends who are also RBIs before making a decision.

"I have four friends. If two of them think that the price will fall but other two not, I have to make a decision myself. However, if they are three out of four, I will follow them." (RBI16)

For psychological reasons, RBIs sometimes consulted a fortune-teller when they are in difficulty. One RBI mentioned that:

"I regular check my luck with foretune-tellers. If they tell me that I will gain, I will take a risk. It depends. Normally I use theory, technique, experience and psychology." (RBI15)

6.5.5.2 *Financial Indicators*

There were two types of price indicators used by RBIs with regard to price forecasting. The first one uses price movements in the futures market directly as a price forecast. The second one uses the technical indicators derived from historical prices.

- **Futures Price Indicators**

The most widely used forecasting method by RBIs is the future market price as an indicator, especially prices in TOCOM and SHFE. One of the RBIs explained his daily price speculation as follows:

"I mainly rely on SHFE and TOCOM. These two markets are those I just showed you their prices on this [his tablet]." (RBI08)

The relationship between physical NR prices and futures market prices are used as an indicator of change over time.

"It is the interchange between TOCOM and SHFE that leads local rubber price movements. In the periods of good economy in China, I will follow SHFE. Otherwise I follow TOCOM." (RBI06)

It is clearly evidence that RBIs also use a combination of methods.

"There are three main rubber future markets. These are the Chinese, Japanese, and Singaporean markets [SHFE, TOCOM, and SICOM, respectively]. However, now they cannot be used as price indicators. In this case, I have to consult experienced ones." (RBI24)

- **Technical Indicators**

The more complicated method for forecasting using prices in the futures market is technical graph analysis. This method uses historical prices and some particular metrics to calculate some indicators of price movements such as the Moving Average Convergence Divergence (MACD), the Relative Strength Index (RSI) and the Stochastic

Oscillator (STO) indicators. Even though the method seems to be complex, it is used by some RBIs.

> *"You need to use both fundamental and technical analyses. Sometimes, if you do not know it, you need to ask others who know what they think about price movements. You have to think more systematically. You cannot rely on just fundamental factors such as there being no supply, but you have to consider technical factors as well, because the world is connected now. You have to change the way you think if you still want to be in the NR industry because the system has changed. You need to apply your experience with regard to fundamental factors to technical price graphs. You have to find whatever is out there to help you survive; otherwise, how can you compete with others?" (RBI09)*

Technical analysis may not always provide the right answer, but it is still useful. For example:

> *"Sometimes it [the NR price] follows the technical graph, but it does not always. It is partly right. Ones who have traded in the financial stock market consider them. They will see these indicators [RSI, MACD] along with price graphs. The stock traders will consider graphs and turning point signals and trading volumes in order to forecast the future. I consult them [stock traders]." (RBI16)*

6.5.5.3 *Quantitative Methods*

It is interesting that quantitative methods are rarely used by RBIs. Only one of the research participants mentioned it. Nonetheless, he expresses that it is useful to RBIs as it can prevent them from panic in the market.

> *"There were price forecasting results that were just introduced this year from the RRIT. They seem to be accurate for weekly forecasts but there was some inaccuracy in terms of monthly forecasts. I followed them for four months. I regularly used them as evidence to argue with other RBIs who mentioned that they knew the inside news when I had a different opinion." (RBI13)*

6.5.6 Futures Market Use

One of core aspects of NR trading is the futures market. The futures markets are used by RBIs for several purposes (as seen in Figure 6.20). Some use the futures market price information for setting decision objectives, such as setting buying prices or making decisions with regard to selling their NR products, while others participate more in the futures market either for the purposes of hedging or speculation.

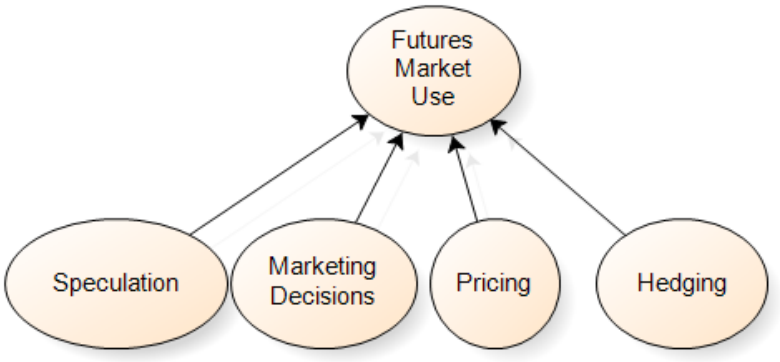


Figure 6.20: The final template of futures market use

6.5.6.1 *Pricing*

It can be clearly seen that prices in the futures market play a vital role in RBI pricing. They use the futures market as a one of the benchmarks for prices in their daily business. RBI15 commented:

> *"I use prices from TOCOM and my business partners in order to set my buying prices. When they offer me the buying price, if I think the price will go down from observing TOCOM, I will set my buying price as equal as or slightly lower than that of my buyers." (RBI15)*

More details with regard to using the futures market in pricing is given in Section 6.5.4.

6.5.6.2 *Marketing Decisions*

In addition to being used for pricing by RBIs, the futures market also plays a key role in decision making that is relevant to selling the NR products they have bought. To gain an advantage as an RBI, generating more profits from price speculation could be achieved using price trends from the futures market. One of RBIs revealed that his marketing decisions were improved after he had obtained a tool to access real time prices in the futures market.

> *"The majority of us follow the Japanese market [TOCOM] to make decisions. This is the TOCOM prices in real time. Since I been able to access these real time prices, my decisions have improved relative to beforehand when I didn't have it." (RBI13)*

6.5.6.3 *Hedging*

One of the well-known functions of the futures market is to hedge the price risk when it comes to holding physical products. In the NR industry, some of the RBIs mentioned the

benefits of using the futures markets in price hedging, although there were also a variety of barriers to using them. One of the RBIs who was experienced in participating in trading in the futures market acknowledged the marketing capacity limitations of physical selling.

> *"Sometimes if I [an RBI] buy rubber and stock it in a full warehouse, I cannot sell all of it at once. At the same time, I have to keep buying more from my customers. If prices drop dramatically, I will sell it in the futures market. I will make a loss in my physical trading, but I will gain in the futures market. It means I hedge price risks with regard to my physical stock." (RBI05, a representative of one processor)*

In spite of using the futures market for hedging the price risk associated with NR products in the physical market, some RBIs also use them to manage NR forward selling in their portfolios in the event that they face sourcing difficulties. One of the USS RBIs explained:

> *"In the event that I sell say, 50,000 kgs NR in forward contracts, and I have not bought it yet, then I am afraid that the price will rise. The futures market will help me. I will buy the futures contract to cover the 50,000 kgs that I have sold. If the price goes up, I will gain in the futures market but make a loss in the forward contract." (RBI10)*

6.5.6.4 *Speculation*

It is surprising that the majority of RBIs trading in the futures markets do so for speculative purposes rather than for hedging. Moreover, they prefer to trade in the foreign market rather than in the domestic one, due to market liquidity issues which, in turn, lead to market efficiency problems. One RBI expressed the following view:

> *"Now, more RBIs have started participating in TOCOM. This is because you can buy and sell it whenever you want. There is a high trading volume there. Conversely, AFET is a market with too low a trading volume. So, when traders see the market going the same direction, such as selling position, the issue is who will be the buyer. The reason for low volumes in trading is that the market mechanism is frequently distorted." (RBI11)*

Another RBI revealed that he used the future market for speculation, not for price risk hedging.

> *"I bought more in the futures market. So, I speculate in the future. If I hedge my price risks, I have to do the opposite of what I did in the physical market. I bought it as it uses only a small amount of money and I can buy many contracts. … However, if I buy in the futures market, I will spend just 30% of it; that is 30,000. It makes me to decide to use it for speculation." (RBI22)*

6.5.6.5 *Limitations of Using the Futures Market*

There were some issues with regard to the futures market that had to be addressed so that they can be used as a more effective hedging tool. RBI07 expressed:

> *"If you ask me that whether we should participate in AFET, I do not really support the idea. This is because I used to get huge losses from trading in the AFET. … It is because of the low trading volume. So, it could be easy to manipulate the market." (RBI07)*

Another RBI added that the size of the contracts in the futures market did not match the physical trading. The volume of contracts is too big to be adjustable to the average size of RBIs dealings. One Latex-RSS RBI commented:

> *"I am looking for the way to hedge price risks in the futures market. However, it has become that its contract volume doesn't match my processing capacity. I can produce 1,000 kgs/day, but the futures contract unit is 5,000 kgs. It is five times my capacity. This is an imbalance; so, it is difficult in practice to hedge the price." (RBI22)*

Another issue in using TOCOM was raised by RBIs in that accessing a foreign market is not legal. Another RBI added:

> *"Trading in TOCOM is still illegal today. We need to trade via a black market." (RBI11)*

Despite the technical issues associated with the futures market to meet RBIs needs when it comes to hedging, the appropriate knowledge with regard to trading was needed by RBIs.

> *"I don't use it because I don't feel confident in it. I still don't understand its mechanism. For example, someone told me that I have to stock real rubber products and if price falls, I should sell in the futures market. I am not sure if I sell in the futures market, whether I should sell my physical stock. I am still confused on it." (RBI13)*

6.5.7 Technology Use

Technology plays a part in NR trading. There is a widespread use of personal computers, laptops, smartphones and tablets in RBIs' daily business. The purpose of using such technologies is mainly for price information, price analysis and accounting, as presented in Figure 6.21.

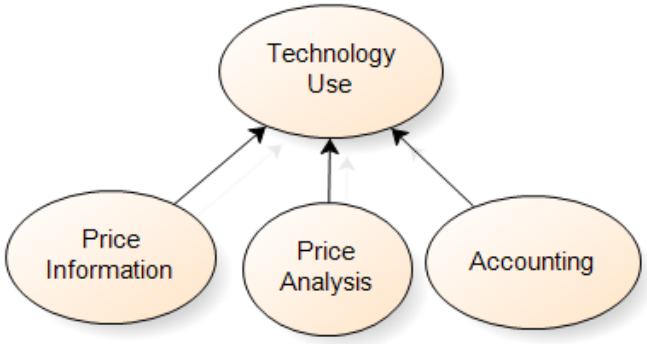


Figure 6.21: The final template of technology use

6.5.7.1 *Price Information*

There is widespread use of technology to gain price information amongst RBIs, since price information is the core of the RBI business. This ranges from using simple technology to such developments as using mobile phones to contact their business partners asking for prices, to using smartphones to access price information on websites One RBI expressed the importance of technology in terms of price information to his business as follows:

> *"If I don't have a computer to follow the market, I'm like a blind man who doesn't know what he should use for making decisions as to whether he should sell or stock it [NR]. Should I stock it? Should I sell it? I have no idea how to make a decision if I don't have it." (RBI16)*

The details of gaining using price information by RBIs are also shown in Section 6.5.3 of this findings chapter.

6.5.7.2 *Price Analysis*

It is not surprising that most technology use is dominated by price analysis, since the NR market has become increasingly influenced by financial markets. The uses of technology range from following price information in the market to the more sophisticated, but rarely used, using specific software to undertake analysis. One of the RBIs mentioned that he uses web browsers to determine price movement directions. As a consequence, he can make a decision based on such movements.

> *"If I hold rubber stock, for example 200,000 kgs, I have to analyse the market. I have to have a tool for myself. For instance, I have the internet to follow market prices. If prices don't look good, I will sell it in forward contracts." (RBI05)*

It was the evident that some RBIs stated that using technical graphs supported NR prices analysis. He showed the graph of TOCOM prices on his monitor and explained:

> *"I'm going to show you the graph. You can see merchants [RBIs] and technology now. This is TOCOM. TOCOM is the Tokyo Commodity Exchange. The price dropped to 239 [Yen/kg] and then rebounded to, the latest yesterday, 245.7" (RBI07)*

Even though technical graph analysis is considered a sophisticated task requiring advanced skills, there was an emerging group of skilled analysts to support those who lacked the necessary skills.

> *"I prefer prices that follow the market mechanism because they can be analysed. There is currently a group of analysts on the website. So, RBIs who trade in rubber plantations use mobile phones to ask RBIs who are capable to analyse the prices." (RBI17)*

NR prices are inclined to behave like those in stock markets. As a consequence, the technical graph is a helpful tool for RBIs. Nevertheless, it has its downside as well. One of the RBIs referred to the limitations of using the technical graph as follows:

> *"I consider the [technical] graph from broker A introduced by my friend. We [RBIs] often use it to help us make decisions. Sometimes, the graph will inform us of a turning point at an early stage, but it isn't 100% correct. It can lure you. Someone told me ironically that if you just look at the graph and can trade rubber, so you don't have to do anything else, just keep looking at the graph. However, it isn't a perfect solution." (RBI18)*

6.5.7.3 *Accounting*

Although NR trading involves many transactions on a daily basis, it was unexpected that the majority of accounting procedures use just simple methods like pen, paper and calculators. However, when asked about the need for accounting software for his business, the RBI who had earned a MBA degree, replied that:

> *"My business doesn't need any software to do the accounts because my transactions are not many. However, if the big businesses like my brother or the RBI A [a large RBI], they may use it because they have many customers. For my business, I don't need it. I can do it by hand." (RBI20)*

It was consistent with the views of another RBI when he showed his transactions in his accounting notebook.

> *"There are no suppliers who sell me 1,000 or 2,000 kgs a time. There are many smallholders. I am going to show you this in my account book. These are my big*

customers selling from 400 to 700 kgs, and these are a lot more small customers selling just 90, 92 or 93 kgs." (RBI07)

6.6 Chapter Summary

It is found that there are several main factors influencing the PRM strategies RBIs adopt. These are the RBI business type, market power, resources and knowledge, and market circumstance. In the daily trading of latex businesses are likely to adopt a back-to-back selling method, while in USS, which is storable, businesses are able to use more complex strategies, such as portfolio management. USS RBIs adopt a variety of PRM strategies, e.g. holding stocks, selling immediately, selling in advance, using market power for negotiation and managing it within portfolios. Cup lump RBIs are capable of speculation as is USS, although cup lump is less storable; however, it requires market power to monitor the grading system, which is considered to be less reliable. A Latex-RSS business tends to adopt a stocking strategy as there are better prices for RSS on spot markets relative to forward contracts. Latex-USS RBIs enjoy a wide range of PRM instruments in USS markets. Therefore, they are capable of using PRM strategies to gain more profits, in addition to the value added to USS from processing latex.

When market prices change to make the short-term out of favour some RBIs use an alternative product marketing strategy as a solution. This strategy is usually found in Latex-RSS and Latex-USS business. However, it is not unusual for it to be found that some latex RBIs process latex they have bought into rubber sheets in order to gain competitiveness when latex prices are unfavourable. For medium-term changes, such as price intervention, RBIs manage to ensure that their business survives by adapting to the new environment. Adaptability plays a vital role in this period, whilst waiting until markets return to normal.

In addition to the RBI types relevant to PRM strategies, some strategies require market power, resources and knowledge for implementation. Price risk hedging in forward contracts needs market credit to operate, as they are in the form of an informal verbal arrangement. Futures contracts are in a formal form. Although they do not require market power, they need both trading knowledge and finance. Hedging is used in back-to-back and forward selling, and portfolio management strategies. In practice, maintaining a level of stock needs high levels of cash flow. Stocking ability is essential in both stock holding and portfolio management strategies. Despite the market power needed in forward contracts, it is obviously vital in the negotiation strategy to gain better deals. It is worth noting that sometimes the PRM strategies RBIs adopt depend upon the price situations they perceive in the market at the particular periods of time.

Risk taking is the key activity of RBI businesses. They are unlikely to always take or hedge price risk, but base their decisions on several factors (shown in Figure 6.4). Amongst these factors, market opportunity, sourcing, stocking and hedging abilities are commonly used in their decisions. However, some factors may make their decisions unfavourable, such as market competition, their business partners' decisions and their financial situation. Furthermore, there are psychological factors, such as the result of previous decisions, current losses and gains from their stocks and unknown results of previous decisions, which are considered from their market positions and current market circumstances. Finally, personal profile factors: age, trading experience and attitude toward price market, also affect their risk-taking decisions.

Once RBIs have decided to market their products, either in cash or forward markets, they need to select a market channel to sell them, or vice versa. The cash markets sell via auction markets, directly to processors and between RBIs. The forward markets are arranged by processors, RBIs and recently some auction markets. The market selection depends upon the types and grades of products bought and buyers' requirements, considering both prices offered and their grading system that leads to final selling prices. Reliability of scale and payment are also considered. As physical goods have to be loaded and delivered operational costs also play an important role. Moreover, the convenience factor and the supplementary service of providing a PRM tool also impact on RBIs decisions.

It is surprising that PRM tools commonly used in western countries, such as futures and option contracts, are rarely used for RBIs' trading. Although futures contracts are used by a few RBIs, they are mostly used for speculative purposes. Options contracts have not been found in NR markets. Forward contracts are the major PRM instrument used by RBIs. Nevertheless, they are informal and require market credit to gain access to them since they are at risk of contract defaults. The basic PRM tools normally used by RBIs are the cash market and stocking, both are exposed to falling prices. At the heart of commodity trading of NR is prices. It involves price information, pricing and price forecasting methods. However, this issue is still a challenging task, as finding the single reliable source of price information, pricing method and, especially, a price forecasting method is difficult, if not impossible. It should be noted that RBI businesses mainly have small profit margins and rely heavily upon their capability in speculation. RBIs have various sources of price information: both the domestic and international market. It is surprising that all types of RBIs, regardless of the NR products traded, make reference to the prices in the TOCOM market in which the RSS3 grade is traded. With regard to pricing methods, RBIs are likely to use a mix to make their business competitive.

Moreover, it is obvious that there is no consensus on the best price forecasting method. However, future market prices and recent technical graph analysis play a crucial role in price speculations.

The futures market and technology are mainly used for activities involving price information access and price analysis. Futures markets contribute to RBIs' trading, mostly in terms of price information about price benchmarks and price trends. They are rarely used for hedging, although some RBIs use them for speculation. Additionally, the use of technology in the RBI business is mainly for price information. The devices used to access the internet, such as PCs, laptops, smartphones and tablets, are commonly used by RBIs to gain access to several NR market websites. Moreover, free software available on the website or sometimes commercial software for technical graph analysis of NR prices is used by some RBIs. The software for accounting is not widely used; this is generally done by hand in notebooks.

The following chapter incorporates discussions on the research findings relevant to PRM practices. This comprises PRM strategies, decision making in risk taking and selling-market selection (as presented in Table 6.2). Moreover, seven aspects of price risk circumstances in NR markets are included (as illustrated in Table 6.3).

Table 6.2: PRM in the context of RBIs

PRM Tasks	Types	Factors
PRM Strategies	• Stock Holding • Back-to-back Selling • Forward Selling • Negotiation • Portfolio Management • Alternative Product Marketing • Adaptability	• Types of RBI Business • PRM Instruments • Business Size • Resources • Knowledge • Experience • Location
Decisions in Risk Taking	• Risk Neutrality	• Marketing Opportunity • Sourcing Ability • Stocking Ability • Hedging Ability • Business Environment • Business Partners' Decisions • Financial Situation • Business Performance • Personal Profile
Market Channel Selection	• Processors • Auction Markets • Large RBIs • Government Organisation • Futures Market	• Types and Grades of Products • Given Prices • Grading Systems • Reliability of Scales • Operational Costs • Reliability of Payment • Convenience • PRM Tools Provided

Table 6.3: Price risk environments

Price Risk Environments	Types
• PRM Instruments	• Cash Price Selling • Selling on Consignment • Forward Contracts • Futures Contracts
• Market Channels	• Processors • Auction Markets • Large RBIs • Government Organisation • Futures Markets
• Price Information	• Futures Markets • Auction Markets • Buyers • F.O.B Prices • Exporter Association • RBI networks
• Pricing Methods	• Marginal Cost Base • Competitive Base
• Price Forecasting Methods	• Qualitative Base • Financial Indicator • Quantitative Base
• Futures Market Use	• PRM Instrument • Market Channel • Price Information • Pricing Method • Price Forecasting • Speculation
• Technology Use	• Price Information • Price Analysis Indicators • Accounting

Chapter 7 Research Finding Discussions

7.1 Introduction

This chapter presents a discussion of the research findings involved in the research question. As mentioned in the literature review, there is a lack of in-depth qualitative research in PRM practices in the NR industry based on an RBI perspective in Thailand. As a consequence, this study set out with the aim of proposing a conceptual model of understanding of the complexity of the PRM practices, which aim to balance gaining profits and reducing the level of price risk (Haq and Rao, 2013), in the context of RBIs, as presented in Figure 7.1. There follows discussions around the three main findings of this research: PRM strategies, decisions in risk taking and market channel selection, including price risk in business environments assessed in terms of seven perspectives, which are: PRM instruments, market channels, price information, pricing methods, price forecasting methods, the use of futures markets and the utility of technology. Firstly, seven PRM strategies were found to be adopted by RBIs and these are discussed both in terms of advantages and limitations, in Section 7.2. This includes the clarity of factors determining their formation. Secondly, in Section 7.3, decisions in risk taking of RBIs, who are mostly considered to be risk neutral – seeking market opportunity from prices increase, decrease or fluctuations are explained and are expressed by relevant factors influencing them. Thirdly, the process and relevant factors in the selection of market channels for selling their products are illuminated in Section 7.4. In Section 7.5, the circumstances of NR trading in Thailand based on the seven aspects are clarified. The linkages between PRM strategies, decision making in risk taking and market channel selection as practiced by RBIs are illustrated in Section 7.6. Finally, Section 7.7 provides the chapter summary.

7.2 Price Risk Management Strategies

The risk of commodity price movements is manageable, using various alternative strategies (Sherafatmand, Yazdani and Moghaddasi, 2014). In this section, the seven PRM strategies used by RBIs (see Section 6.2), as shown in Figure 7.2, are discussed in terms of their advantages and limitations in practice. The first strategy to be discussed in this research is stock holding.

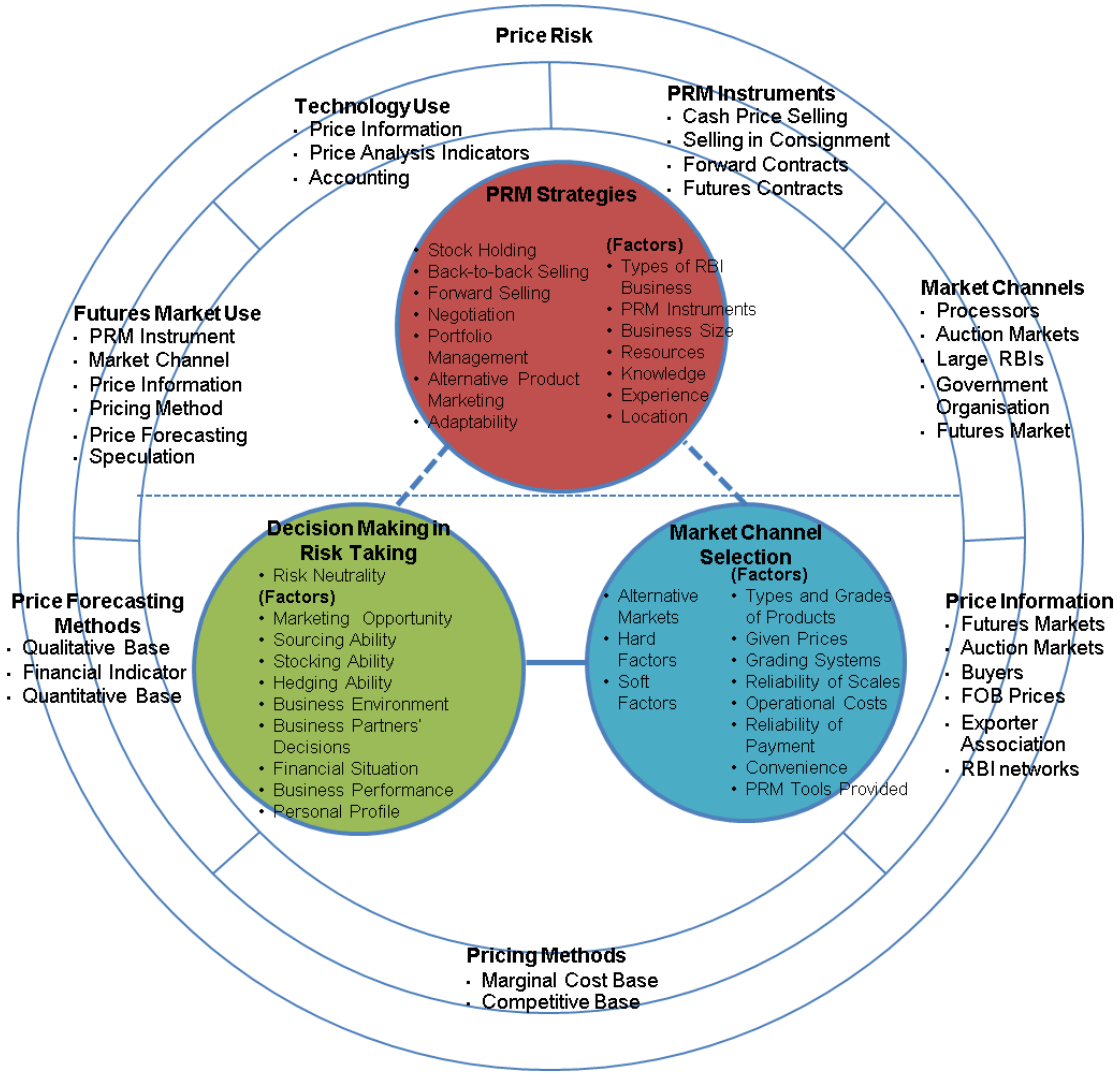


Figure 7.1: The conceptual model of PRM practice

- **Stocking**

Stocking is likely to be widely adopted by RBIs (see Section 6.2.1). This may be explained by the fact that sourcing is a key activity of RBI business and stocking is necessary to hedge price risk to what they have bought. Another possible reason to explain this is that the strategy requires no PRM tool. For instance, some RBIs, especially novice or small RBIs, may be forced to adopt stocking as they tend to be incapable of accessing effective PRM tools, such as forward contracts. Regarding supply chain integration, stock holders tend to isolate themselves from other supply chain players (Williams and Malcolm, 2012). This corresponds with new or small RBIs which are considered to be less able to integrate the market, due to lack of operations in PRM activities with other NR supply chain players.

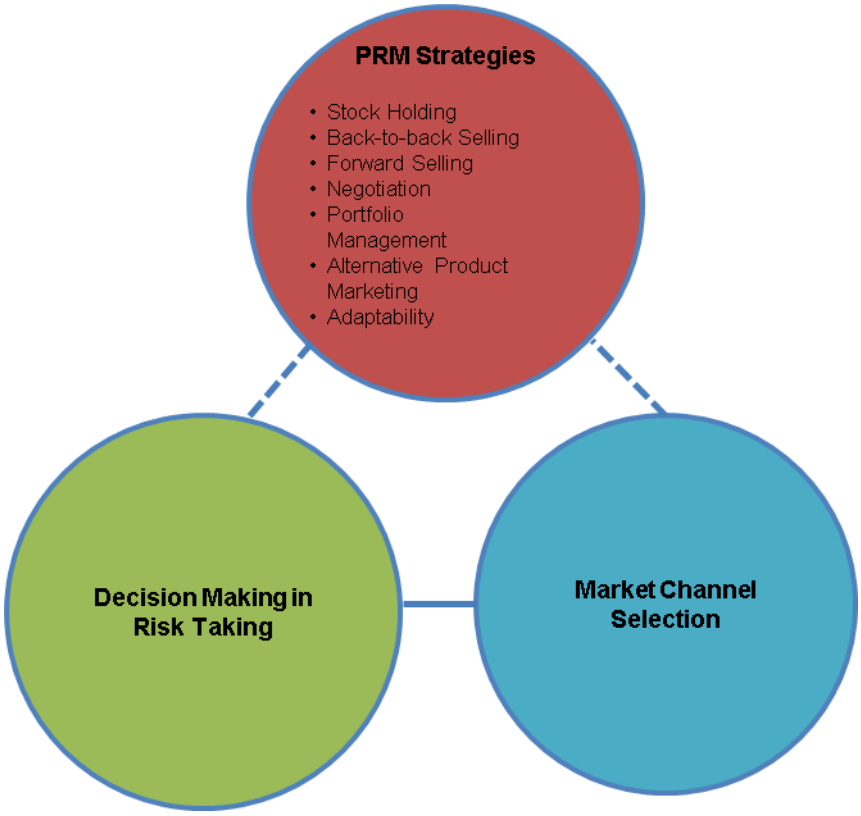


Figure 7.2: PRM strategies of the proposed model

Regarding its performance, stocking seems to be a risky management strategy, although it may perform well during periods of upward price trends. This is due to the fact that commodity prices are unlikely to rise in the long term. Therefore, making profits from buying the NR and waiting for better prices is exposed to falling prices. Moreover, stocking NR involves operational costs and has a risk of product deterioration. It is evident that offered prices for cash selling are likely to better those of forward contracts. The risk becomes even higher during periods of excessive price volatility (Taylor, Tonsor and Dhuyvetter, 2013). Even though profits may be gained from selling at higher prices, it is doubtful that they can compensate for the higher costs and risks. Moreover, it is important to note that the nature of RBI business is to operate continuously on the buying side. As a consequence, RBIs may stock products bought at a high price which, in turn, leads to difficulty in reselling it at a profit. Thus, stocking, in this case, may result in losses.

Another way of stocking NR products, without the risk of their deterioration, is to sell on consignment with their business counterparts. RBIs may manage their cash flows by receiving some payment for their product deposit value. However, they may be confronted with a counter party risk of contract defaults, which occurs on many occasions in periods of price volatility. Another issue of selling on consignment is that

RBIs seem to lose their market power to processors who have already received NR products from RBIs. Therefore, RBIs may not gain benefits from waiting for better prices as processors may not intend to increase buying prices to NR depositors, but buy at higher prices from cash markets instead.

- **Back-to-back selling**

The results of this study show that one of the methods in dealing with price risks found in practices of RBIs is transferring them to other parties by hedging them, or buying and reselling physical products as rapidly as possible (see Section 6.2.2). The back-to-back selling is the ideal strategy for RBIs who are considered to be risk-averse. The strategy allows RBIs to lock the certain level of profit they require and pay more attention to other areas of their business. In terms of type of business, the strategy is dominant in the latex supply chain. Perhaps, this is the result of the short life cycle of this business structure. However, one of the limitations of this strategy is that it does not allow RBIs to grasp opportunities of making more profits from price movements: both price increases and decreases. This issue is identified by Geldenhuys, Dreyer and van Heerden (2014) who indicate the need for improvements in hedging performances.

However, to adopt this strategy for NR products, except for NR products that are able to be resold immediately, such as USS and latex, the required PRM tools, such as forward, futures and option contracts, are needed. These tend to be underdeveloped, or not exist, in the Thai NR market. The available PRM tools are mostly arranged informally with business partners and they are selectively provided. Therefore, the barrier to accessing such PRM tools is obstructing some RBIs from using the back-to-back selling strategy in their business.

Even though some RBIs are able to gain access to PRM tools, the competition in the market occasionally forces the profit margins of RBI business to be very low or even buying at a loss. As a result, the product cannot be resold immediately to make proper profits, which, in turn, make RBIs shy away from using the back-to-back selling strategy and, instead, rely on their speculation.

- **Forward Selling**

One interesting finding is that forward selling seems to be a popular PRM strategy of RBIs in previous periods when a market was less competitive and prices were less volatile (see Section 6.2.3). A possible explanation is that when the market is in such a condition, NR processors and RBIs can share benefits together. Nonetheless, the

commodity market structure has changed during the last decade (Irwin and Sanders, 2012). As a result, such relationships may be broken down when price movements become highly volatile. Another reason to explain this may be that forward selling requires relatively low capital compared with stocking (Williams and Malcolm, 2012).

Forward selling is the opposite of stocking. Instead of buying before selling, it is not unusual that some RBIs sell the NR products in advance of sourcing them. It is considered to be a back-to-back selling strategy if they sell the NR in advance the same amount as they hold physically. However, if they sell more than they hold in stock, they become speculators.

Forward selling is effective when prices have a downward trend. However, if prices rise, it may lead to trade losses. To adopt this strategy, RBIs need to be able to get access to PRM tools, such as forward or future contracts. Regarding the NR market in Thailand, the forward contract plays a vital role as a main PRM tool, even though it tends to be arranged in an informal way. Also, it is risky for these organisations to be found in default. This can be an obstacle to agricultural processors in adopting the strategy (Aidoo *et al.*, 2014). RBIs that are able to access it tend to be willing to use it. A likely explanation is that there is a lack of other effective PRM tools to support formal trading. Therefore, those who can access it are allowed to gain an advantage when prices become volatile or fall, as they expect higher profits. It is unsurprising that the strategy is mainly adopted by large RBIs as it requires market power to implement it via forward contracts.

- **Negotiation**

The most obvious finding to emerge from the analysis is that negotiation plays a crucial role in trading NR (see Section 6.2.4). This is because some trading methods are still less reliable than others; for instance, grading systems in cup lump and quality measurement in latex. In addition, market power in pricing of processors is likely to be significantly higher than that of RBIs. Therefore, in order to share the benefit between NR processors and RBIs, some issues of dispute in trading tend to end with negotiation. Unsurprisingly, the strategy is dominantly adopted in latex supply chains as it is frequently traded (usually on a daily basis) in large volumes. Moreover, it is also widely adopted in cup lump because the issue of the grading system tends to require negotiation.

Market powers of RBIs are normally derived from volume in trading. As a consequence, there is a tendency for the larger RBIs to gain better prices than the small ones.

Therefore, large RBIs tend to have an advantage in getting better prices or gaining easier access to PRM tools provided by processors. It seems possible that this result is due to the fact that processors gain an advantage from lower transaction costs by dealing with a few large scale suppliers. Another possible reason may stem from the issue of reliability of suppliers, as the deal is usually done informally.

It is clearly seen that even this strategy may work well in the normal market situation. However, when NR market prices become highly volatile, which has occurred several times in recent years (Boonyanuphong and Sriboonchitta, 2014), the power of negotiation tends to decline or is sometimes even dysfunctional in denying existing contracts from processors.

- **Portfolio Management**

The current study found that rather than relying solely on market power, some RBIs use their market decisions in order to utilise their market opportunity (see Section 6.2.5). To adopt a portfolio management strategy, RBIs need fundamental resources in order to implement it. This includes the resources required for stocking, back-to-back selling and forward selling strategies so that RBIs can gain advantages from different price scenarios. Moreover, it especially needs knowledge in price speculation. The strategy can overcome the limitations of the risk of falling prices in the stocking strategy, of the rising prices in the forward selling strategy and the lower likelihood of gaining higher profits from market opportunities in the back-to-back selling strategy. This could utilise the opportunity of price enhancement by stocking, reduce the risk of price decline by selling in advance, or reduce price risk exposure by back-to-back selling. This strategy is found to be widely adopted by USS RBIs since these products can be stocked and also sold in advance. Moreover, as being evidence in the research findings (see Section 6.5.2), USS is the most speculative product in the NR market. However, it is not unusual to see the strategy adopted in other NR products.

Apart from the requirement of fundamental resources to implement this strategy, the performance of the strategy is heavily based on RBIs' decisions on marketing and seems to be a challenging task. This is consistent with the views of Sherafatmand, Yazdani and Moghaddasi (2014), who note that the best decisions in hedging should be varied over time. In other words, price forecasting plays a crucial role in this strategy and it is a widely held view that the accuracy of existing forecasting methods tends to be not very high. Moreover, such decision-making is usually undertaken within price uncertainty. It means that it is the difficulty in evaluating their decisions which, in turn, leads to the

obscurity in learning from their experiences. Therefore, the business performances of individual RBIs may vary from one to another even though they have adopted the same strategy of portfolio management.

- **Alternative Product Marketing**

It is interesting to note that to make their business more resilience to short-term unfavourable business environments, some RBIs may build their business to be flexible, such as selling latex to concentrated latex processors rather than processing it into rubber sheets (see Section 6.2.6). This enables them to sell their products to markets other than their normal ones. This is common in the business relevant to latex, which is able to be transformed into other NR products. For instance, Latex-USS or Latex-RSS RBIs might decide to sell their product in a latex form rather than processing it into rubber sheet, as latex prices are high relative to rubber sheets. On the other hand, latex processors might choose to process latex into rubber sheet in a period of high rubber sheet prices. This strategy seems to work well during unfavourable price periods relative to competitive NR products. A similar decision in selecting competitive products is found in wheat and wool trades in Australia (Culas, 2014); although both products cannot be directly transformed from one to another. Instead, they compete for the proportion of land on which they are reared and decisions tend to be sensitive to their levels of pricing.

Nevertheless, the alternative product marketing strategy tends to require some time to be implemented and RBIs need to ensure that the market is in their favour or it cannot be fully implemented as it must maintain the minimum level of operation. However, this strategy seems to be helpful for RBI businesses, in order to reduce their risk of losses. Furthermore, it is believed that selling NR products to an alternative product market leads to the rebalance of NR products as an output to meet each type of NR product requirement.

- **Adaptability**

Another important finding was that to cope with longer-term market changes, such as increasing price volatility or price intervention, existing tools or management strategies may be inadequate. This corresponds with the arguments of Aggarwal, Jain and Thomas (2014) who state that government intervention impacts on the usual hedging function. It may require a new method of management to adjust to new business environments. Adaptability plays an important role in such situations. To deal with price volatility, RBIs may need new, effective PRM instruments which the Thailand NR market seems to lack. Moreover, to deal with market price intervention, they may need to study and avoid the

impact of new regulations. Although many RBIs feel an impact from market prices becoming more volatile, many of them suffered more from the price intervention scheme which cut their role in the supply chain. To survive such situations, many of them scale down their business to maintain low levels of operation. An explanation is that RBIs feel uncertain of their future situation (see Section 6.2.7). Therefore, they try to maintain their business with an eye to a future opportunity. Moreover, some RBIs adapt to take an advantage of the situation by forming a group of farmers to participate in the scheme which buys NR products at above market prices. Even though many RBIs can operate their business through various situations, some of the strategies they used seem not to be transparent.

Factors Influencing PRM Strategy Formation

To manage price risk in RBI business, PRM strategies are formed from some of the following factors, as shown in Figure 7.3. Such factors are types of NR products traded, PRM Tools used, size of business, resources, knowledge, experience and location (see Table 6.1). The discussion in more detail follows from this presentation:

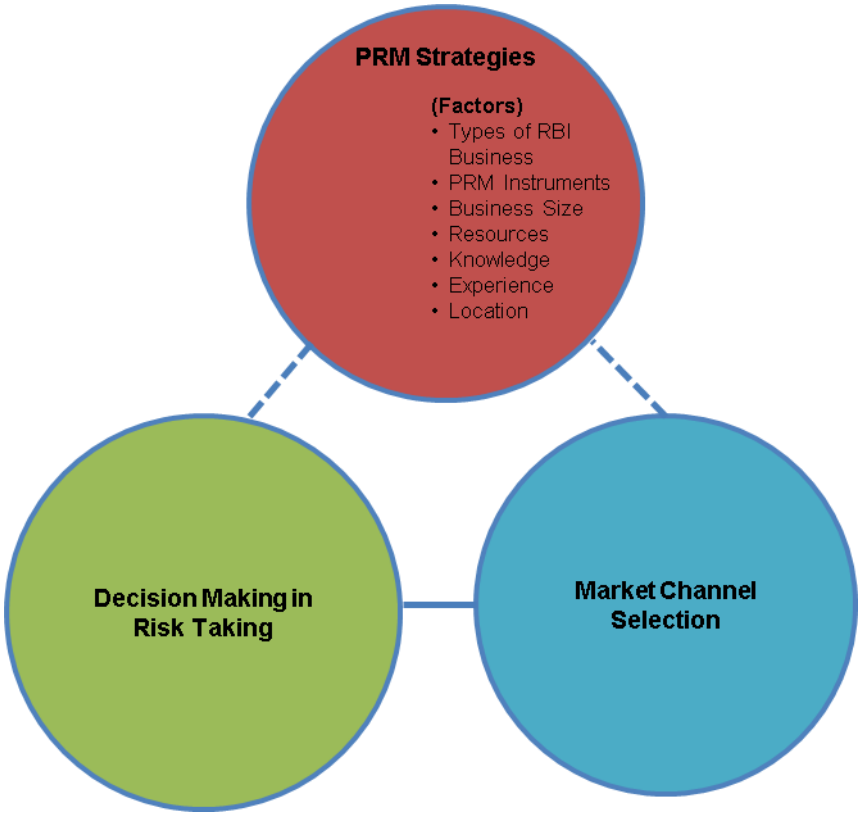


Figure 7.3: Factors influencing PRM strategy formation of the proposed model

- **Types of RBI Business**

Price risks exposed by RBIs are varied according to different types of RBI businesses. This finding is analogous to Newman's (2009) findings which showed that coffee market structures influence price risk exposures. RBIs which are involved in trading rubber sheets, both USS and RSS, are amongst the most sensitive to price movements as they are competitive products trading with low margins and the most transparent methods in grading. As a consequence, USS, Latex-USS and Latex-RSS RBIs are more active in managing the risk of price volatility than latex and cup lump RBIs. Although some cup lump RBIs actively manage price risk, lower transparency in the grading system may dominate price management when the RBIs have an advantage in market position relative to their business partners.

There are differences in price risk exposure based on types of business. Latex-RSS and Latex-USS businesses seem to have a higher exposure to it. This is consistent with the work of Maples *et al.* (2013) pointing out that price volatility may severely impact on processors who are involved with both input and output prices. Sequentially, different types of RBI businesses are naturally likely to employ different PRM strategies. The reason behind this is mainly due to particular types of RBIs business being exposed to price risks at different levels. This is mainly dependent on their business' life cycle time. The longer the time spends on business activities, such as processing and transportation, the higher is the exposure to price risk. For example, latex RBIs adopt a back-to-back trading strategy as the nature of latex is traded within a day, whilst USS RBIs adopt more variety of strategies, ranking from stocking, forward contracting, back-to-back selling or a mix of all three.

Moreover, not only does the business cycle time influence PRM strategies adopted by different RBI business types, but so also does the market channel available to the end product as well. NR processors into USS have easier access to PRM tools (as market channels provide) which, consequently, impacts more on the PRM strategies selected, than that of RSS. This is explained by the fact that the USS product is traded via several market channels, especially auction markets, but the RSS is mostly traded directly to a few processors. For the NR product that is less transparent in a grading system, a PRM strategy of negotiation plays a crucial role. Market power gives RBIs more control in the variance of grading products. As a consequence, they are able to trade a high volume without being concerned with the uncertainty of their NR grade. Cup lump is a salient example of this.

- **PRM Tools**

PRM tools play a vital role in PRM strategy adoption since some particular PRM strategies require specific PRM tools to be implemented (see Section 6.2). A good example of this is the forward selling strategy which needs forward selling tools, such as forward or futures contracts. Moreover, even though the back-to-back selling of latex or USS needs no PRM tool other than reselling them immediately, Latex-USS or Latex-RSS intermediaries require such forward selling tools, as they need some period of time to process latex, before reselling it physically, in the forms of USS or RSS, respectively.

The PRM tool is a key factor in explaining the gap between PRM strategies, that RBIs would like to adopt and those used in practice. Some RBIs prefer and do hedge their price risks. As a result, they are exposed to price risks because of the inaccessibility of PRM tools. This is in line with the findings of Blank, Saitone and Sexton (Blank, Saitone and Sexton, 2014), who identified that the types and performances of existing PRM tools for livestock farmers were inadequate. Therefore, the improvement of the availability of PRM tools to RBIs is one of the ways to improve the efficiency of the NR supply chain, or at least to prevent the RBIs from frequent collapse.

- **Business Size**

The size of business implies the level of benefits gained from trading (see Section 6.2). In addition, in the NR business, market power is mostly gained from the volume of the RBIs trade. Thus, business size is a key factor of this. Big RBI businesses tend to have more choices of PRM tools which, in turn, allow them more PRM strategies. In contrast, a novice or small RBI business may be unable to access these tools. This corresponds with the views of Sikawa and Mugisha (2013), who found that chosen marketing methods of producers in the milk industry are influenced by its capacity. Newman (2009), also found that futures and option contracts are not used by local coffee exporters as a result of small trading size. Some small businesses rely only on a stocking strategy, where they are exposed to a falling price risk. However, even though big RBI business can adopt higher performance PRM strategies, like back-to-back selling or selling in advance, their business outcomes depend on their decisions in trading which seem to be uneasy at the present.

- **Resources**

Some PRM strategies require some level of resources in their implementation (see Section 6.2). For instance, a stocking strategy needs a proper warehouse and some

level of cash flow. In terms of cash flow, the higher the better for the strategy, as it can help RBIs to stock NR longer in the period of falling prices. Therefore, the RBIs are able to keep operating their businesses while waiting for better prices. This technique is widely used by RBIs when they suffer losses from their stocks of NR. In contrast, RBIs with insufficient resources may be forced to sell their stocks, even incurring losses, without the flexibility in managing it. This is in accord with that of Williams and Malcolm (2012) who noted that limited cash flow may be a main factor in forcing farmers to sell wheat in the cash market.

Another example of this is using future contracts for price hedging. This needs some level of capital; initial and maintenance margins, to maintain the contract and requires even more when market prices move in an unfavourable direction. This is in line with Newman (2009), who argued that financial constraints result in small coffee exporters not being able to participate in futures and option markets. Additionally, it is worth noting that some processors may ask for some cash deposit for forward contract establishment. Moreover, Taylor, Tonsor and Dhuyvetter (2013), found that the forward contract deposit becomes even larger for wheat farmers in periods of high price volatility.

- **Knowledge**

Some PRM strategies need a particular knowledge in order to implement them, although some PRM tools such as forward and selling on consignment contracts are arranged in an informal way (see Section 6.2). Futures markets, on the other hand, are sometimes used for the purpose of forward selling. In trading in futures markets, RBIs need some relevant knowledge of the futures market mechanism. This confirms the finding of Sikawa and Mugisha (2013), who found that milk producers who have a high level of education tend to adopt new and formal marketing methods. To gain this knowledge, RBIs need to be adequately trained by experts. However, it is believed that this kind of training is not widely available. When this lack of training is combined with the difficulty of gaining from trading in the futures market, RBIs rarely participate in the futures market for hedging price risks of their businesses.

Knowledge also plays an important role in some PRM strategies. For instance, in adopting a portfolio management strategy, some RBIs study a technical graph analysis in order to make their decisions in trading. On many occasions, its performance is still questioned. Most RBIs who used it accept that it has potential as a solution for the future, although some of them explained that it is better than having nothing to guide them in difficult times.

- **Experience**

Learning from experience is the main source of knowledge in NR trading (see Section 6.2). Trading NR is a business that is involved in a not well defined market. Welch (2013), pointed out that market-based training courses for farmers led to PRM skill creation. Unfortunately, there is currently no particular course of study, teaching or training to become an RBI available in Thailand. Therefore, experience plays a key role in PRM strategies used. It is evident that the more highly experienced RBIs tend to perform better than those of the novice ones.

Nevertheless, as the market price has become increasingly volatile in recent years, RBIs may require more than just previous trading experiences in order to survive. This is because the business environment may change from that which they have previously experienced. Therefore, to deal with a new situation a new strategy is needed.

- **Location**

Locations have different impacts on choosing PRM strategies (see Section 6.2). It is an unquestionable fact that PRM strategies have a relationship with the availability of market channels and PRM tools, which are ultimately relevant to a particular location. For example, the locations which are distant from auction markets rely mainly on their business partners, such as processors or big RBIs. RBIs in these locations mostly rely on the forward contracts offered by their partners. In contrast, a business which is located near auction markets may employ a stocking strategy in order to gain the premium price from spot markets.

Locations may have an influence on a PRM strategy adoption related to the competitiveness of the market. RBIs whose business locates to low competitive areas are likely to adopt a less risky strategy like back-to-back selling. However, a business in the intensive competition areas needs to employ more risky strategies in order to make their business competitive.

So far this section has focussed on PRM strategies. The following section will discuss decisions in risk taking.

7.3 Risk Taking Decisions

It is unsurprising that the majority of RBIs seem to be risk neutral or opportunistic rather than being solely a risk taker or risk avoider (see Section 6.3), as shown in Figure 7.4. Although latex RBIs appear to be risk averse, as their business cycle is on a daily basis,

they have to make their decisions on competitive pricing that, on some occasions, ultimately leads them to suffer losses. Perhaps the most difficult task for an RBI is to make decisions in marketing their products. Mostly, it is the main decisive factor in making or losing money. However, the decisions made within the risky, or even uncertain, environment, lead to the complexity of the process. The business environment has also evolved over time; particularly when the whole commodity market has become more financially-based (for NR market transformation see Section 5.2). The decisions made are difficult to prove right or wrong in these circumstances. Therefore, in practice, no consensus in a single set of factors is used for this purpose. A likely explanation of this may be that such decisions are based mainly on individual judgement rather than a well-defined theoretical framework (Rasmussen, 2013). The following sections show the relevant factors that were used in decision-making.

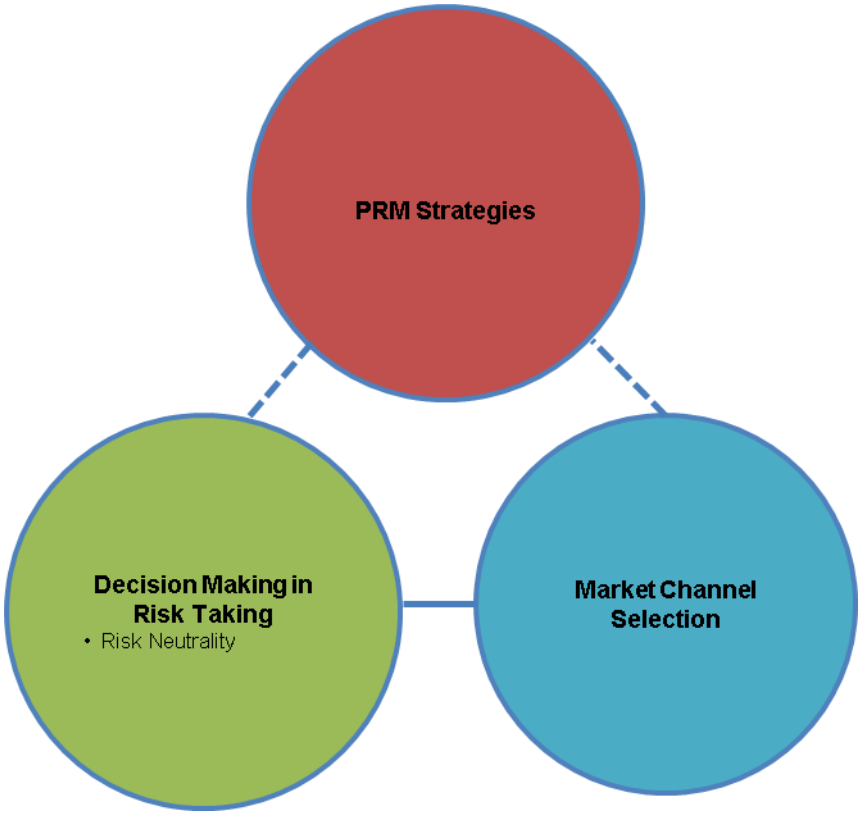


Figure 7.4: Risk-taking behaviour of the proposed model

Factors Influencing Decision Making in Risk Taking

With regard to trading activities, RBIs have to make their decision either to sell, stock, or hedge its price risk on a daily basis. This decision seems to be complex as it is made under the uncertain business environment of price volatility. Such complexity in decision-

making was also found in the context of farming as the decisions involve a number of factors (Celio *et al.*, 2014). Although it indicates a decisive trading performance, making the correct decision is still a challenging task in NR trading. The following is a discussion of the particular factors, as shown in Figure 7.5, which impact on RBIs' decisions in risk taking.

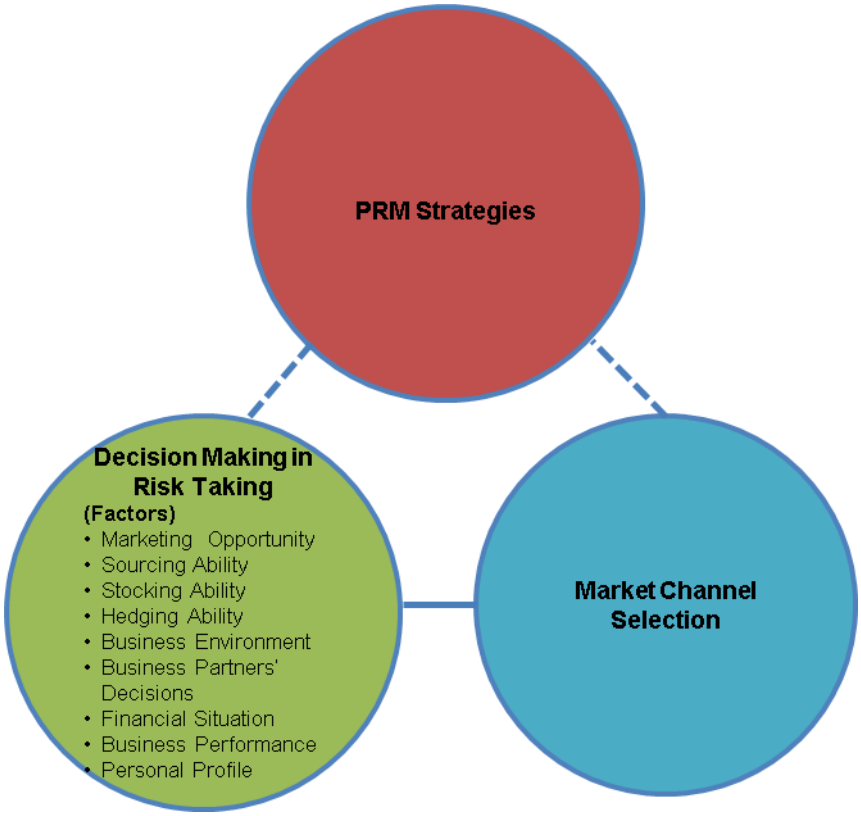


Figure 7.5: Factors influencing risk-taking decisions of the proposed model

- **Marketing Opportunity**

One of the main factors influencing RBIs' decisions to either keep or sell their holding NR stocks is the opportunity to gain more profits from their market position and market environment (see Section 6.3.2.1). Current market circumstances and expectations of the market in the future are relevant to the decision-making process. Some RBIs may decide to sell or hedge their NR stocks based on their price expectation. This is consistent with Anastassiadis *et al.* (2013) who found that farmers tended to hedge price risk if current prices were above their anticipation. The current situation was mainly assessed by comparing offered prices received from buyers and the prices from main reference markets which included buyers (processors and big RBIs), local markets (auction markets), export markets (FOB) and futures markets (AFET, TOCOM, SICOM and SHFE). This price premium seeking behaviour was also found in producers in

electricity markets (Fausti *et al.*, 2014). This mechanism makes the market efficient as RBIs play a role of price seeking. As a consequence, this leads to the competitiveness of the NR market as a whole. That means there is a price transmission process amongst players in the Thai NR market which, in turn, leads to the market price becoming more transparent. Nonetheless, since the transmission of NR prices from the futures market seems to be asymmetric; sometimes it may mislead RBIs in decision-making as they tend to expect a linear relationship. Furthermore, the relationship of the buyer-offered prices and international markets may become more complex owing to the currency exchange rate that has a direct impact on prices.

Not only do RBIs depend on their current market conditions, the future plays a crucial role as well. This is unsurprising as RBIs are considered to be market opportunists, meaning that, if they have a chance to make more profit, they are likely to grasp it. Although the majority of RBIs admitted that they tended to take risks when they saw a high probability of winning, in order to do so, the RBIs needed to speculate on future prices. This task seems to be challenging, especially in periods of excessive price volatility and many RBIs said that they were unable to deal with such challenges.

Such volatility may result from the NR market changing from trading prices, depending on fundamental factors, into futures markets (see Section 5.2). This is perhaps because improvement in technology has allowed price information amongst NR markets to be exchanged quickly. However, it also permits speculators, who are suspected of playing an important role in price volatility, to participate easily in the futures markets (see Appendix U, Section 1). As a result, the capability of NR price forecasts shifts from a fundamental base, in which main RBIs have expertise, to a financial base that involves a new skill that RBIs need to learn. Even though some groups of RBIs have started learning, they need some time to improve this new skill and the actual performance of the technique is still questioned.

- **Sourcing Ability**

As the nature of RBI business relies on the market power resulting from trading volumes, sourcing ability plays a key role in this business (see Section 6.3.2.2). In addition, the level of ultimate trading results, either gains or losses, is consistent with the size of the market position they hold, which usually comes from their stockholding or forward contracting. Therefore, their ability in sourcing based on their past, current and future is important in RBI business and it may influence their decisions in risk taking as follows:

The past of RBI sourcing reflects their stock holding, apart from what they have already sold and it affects their current buying decisions because RBIs tend to maintain their level of risk exposure via managing level of stock holding; either buying or selling it. Therefore, their subsequent decisions in risk taking depend partly on their current stock holding. However, they may be unable to manage their NR stocks at the expected level consistently and perhaps this problem mainly stems from supply uncertainty.

Two of the factors that allow RBIs to speculate on future supply are weather and season. It is obvious that NR products are unable to be produced during rain because of the risk of tree disease. Subsequently, periods of rain cause potential lows of upcoming supply of latex and a short future of other NR products. Therefore, it may make RBIs reluctant to resell their stocks because a lower supply may result in increased price in the future. This supply uncertainty influencing RBIs' decisions in selling their stocks is in line with the findings of Maples *et al.* (2013) which is the cattle price uncertainty influencing beef processors' decisions in sourcing. With regard to seasons, some RBIs may expect premium prices in the dry season as NR production is commonly low during this period. It may thus influence their decisions to take risks by holding stocks from sourcing from prior periods. Nonetheless, as NR price movements may move away from fundamental factors to financial factors, RBIs may run the risk of losses from their decisions based on the supply factors mentioned above.

Future sourcing ability might reflect an historical sourcing capacity. This factor may impact on RBIs' decisions, not only in when to sell their products, but in terms of selling volumes as well. Particularly, RBIs who experienced difficulty in sourcing tend to be reluctant to sell their products if this results in losses from falling prices. The probable reason for this may be that the RBIs expect to buy more NR products in periods of low prices thereby lowering average prices of stockholding. This averaging-price technique is also normally used by wheat pools in selling wheat in Australia (Williams and Malcolm, 2012). In contrast, large RBIs who are considered to be able to source more easily, tend to sell their stock if they expect falling prices. Therefore, the factor of ease of sourcing is able to partly explain RBIs decisions in risk taking.

- **Stocking Ability**

In order to speculate on the uptrend in market prices, RBIs need two vital resources to enhance stocking capability; these are appropriate warehouses and capital (see Section 6.3.2.3). These findings are consistent with those of Ranganathan and Ananthakumar (2014) who found that in emerging markets, the underdevelopment of a storage facility

and limitation of capital had an impact on PRM. Although NR is considered to be cash-product trading, to take more advantages from increasing prices, it requires some level of cash to implement it. This is consistent with Williams and Malcolm (2012), who found that some wheat farmers were unable to stock their produce as a result of shortage of capital. In trading NR, perhaps the main profit RBIs make comes from speculation rather than having a constant profit margin. Therefore, the RBIs who have a longer cash flow tend to take more price risk than ones who have a shorter cash flow. This can be explained by the fact that the longer cash flow seems to have more resilience to short term price fluctuations. It allows the RBIs to take an advantage of buying and stocking during periods of low prices. Therefore, they are able to take more price risks despite the high concern with making losses whilst the short-term cash-flow RBIs are unable to take the same risks.

It is obviously seen that market speculation has a high relationship to warehouse capacity, as it is traded in a physical market. An individual NR product requires a different warehouse to store it. Cup lump, for example, is difficult to stock without losing its weight. Therefore, it is unlikely that the RBI will take a price risk by stocking it without a proper warehouse. Although there is another method of price speculation, by selling on consignment and waiting for rising prices, this tends to limit market power to just a few buyers, if not a single one.

- **Hedging Ability**

Hedging ability may influence RBIs in NR trading decisions (see Section 6.3.2.4). This is because, to hedge their price risk, they need PRM tools. This is again consistent with Williams and Malcolm (2012) finding that the decision by farmers, to take risks by stocking, may result from the difficulty in using alternative PRM tools. Even though the majority of RBIs agreed that their business relies mainly on risk taking, they add that, on some occasions, they prefer not to take risks. However, sometimes, without proper PRM tools, they have no option but to be exposed to risks. Therefore, hedging ability, derived from PRM tool accessibility and knowledge in hedging or using the PRM tools, plays a vital role in risk taking. Moreover, Welch *et al.* (2013) found that the performance of PRM tools also impacts on the willingness to use them. Therefore, this may influence users' decisions in risk taking.

- **Business Environment**

One important phenomenon in the NR market in recent years has been increasing market competition (see Section 6.3.2.5). This may be from the improvement of

communication technology which enhances accessibility to price information (Nakasone, Torero and Minten, 2014). It eventually leads to the increase of farmers' market power (Goyal and González-Velosa, 2013; Nakasone, 2013). This is also in line with the findings of Boyer and Brorsen (2013), that cattle suppliers expand trading benefits from beef processors' competition as a result of gaining market information.

Another reason is the propensity of new RBIs who mainly come from farmers as they gain more savings during periods of high NR prices. This is consistent with Abdlatif *et al.* (2014) who notes that increasing the number of merchants participating in the dried fish market results in price competition. The third reason may come from the higher volatility of NR prices, which some research indicated was a result of price speculation. As a consequence, the increase in market competition leads to low profit margins for RBIs and this may force RBIs to take greater price risks. To deal with such stresses from market competition, Welch (2013) suggested the need for PRM skills.

- **Business Partners**

Buying NR products seems to be a passive activity for RBIs, although they are active in offering buying prices to their suppliers (see Section 6.3.2.6). This is because trading occurs when their suppliers, mostly farmers, want to sell rather than when they want to buy. This market mechanism is also found in the work of Mitra *et al.* (2012). Hence, sometimes it is difficult to make profits as they buy at the high price. As a result, they may take higher risks in order to make some profits. Therefore, their decisions in marketing products, sometimes depend on their suppliers' decisions as well.

When selling, RBIs might adapt trading to be consistent with their buyers, mainly processors, so that they can share the benefits or risks. By sharing them, the buyers may offer forward contracts to RBIs as a PRM tool. Their business partners' offered prices imply the competitiveness of their business as this business is considered to be price-driven. However, sometimes, even though their business partners offer them low prices relative to their competitors, they may decide to take more price risks by competing with their competitors without regard to the offered prices they received. As a consequence, they may need to take risks.

Some groups of RBIs are able to share risks and benefits with their buyers, while other groups are not. A possible explanation of this may be that the second group may have the lower market power of the small or novice RBIs. Therefore, their decisions in selling have a tendency to isolate them from their buyers. This confirms the findings of Williams and Malcolm (2012) that selling decisions of wheat farmers who adopt a stocking

strategy (do not use PRM tools provided by others) tend to be independent from other stakeholders in supply chains.

- **Financial Situation**

One of the factors that forces RBIs to take higher price risks is debt (see Section 6.3.2.7). RBIs that are in debt are likely to take higher risks in order to gain enough profits for repayment or so that they can be compensated with the interest rate. In contrast, RBIs who run the business with their own money are inclined to avoid taking risks if they think the risk is too high.

Interestingly, RBIs who are debtors of their suppliers are also being forced to take price risks as well. This commonly occurred in latex supply chains as RBIs usually subsidised their suppliers by providing a loan. As a result, they need to keep operating their business, so that they can stay in contact with their borrowers; otherwise, they may lose the loan.

RBIs that have alternative earnings, apart from their business, tend to take less price risks than those who do not. This is in contrast to the findings of Mehta (2012), who stated that farmers who also earn income from other sources tend to take higher price risks because they can compensate for their losses. Some RBIs, who rely solely on the income from their NR trading business, may take more price risks trying to earn enough for their spending and to reach their target income. On the other hand, RBIs who have alternative incomes may be secure with enough money to spend.

- **Business Performance**

The results of previous decisions may affect successive decisions in either reinforcing or destructive ways (see Section 6.3.2.8). Some RBIs admitted that they may even take higher risks if the previous decision result is positive. In striking contrast, RBIs who experienced getting a high level of losses are reluctant to take risks in subsequent decisions. They admit that, regarding the nature of their business, they cannot always avoid taking risks. However, if they have an opportunity to avoid it, they will. It is worth noting that suffering from negative results of prior decisions may affect RBIs in different ways. The highly experienced RBIs tend to manage this pressure better than those with less experience.

During periods of price volatility, it may be difficult to assess the result of a single decision; therefore, the unrealised profits and losses from the current market position resulting from earlier decisions may impact on subsequent decisions in risk taking.

Sometimes, the result of NR trading does not come from just a single decision, but, instead, from a series of decisions taken according to market price movements. The situation during these periods is complex, as not only may the situation be a consequence of a previous decision but, perhaps, the uncertainty of the future, which may change, will also influence future decisions. The important issue to be researched about risk taking, based on current market positions, was also suggested by Neyhard *et al.* (2013).

Perhaps, one of the most important factors in explaining RBIs' risk-taking behaviour is the gain and loss factor. RBIs are likely to take no price risks by buying and reselling as soon as possible as long as they can generate profits. On the other hand, if they suffer losses from stocking, they are reluctant to sell at a loss. They usually decide to take more price risks by waiting for better prices. This might make things worse, especially during price downtrends. In some cases, they shut down their business so that they can wait longer to sell their stocks at a gain, rather than accept current losses.

- **Personal Profile**

Experiences in trading allow RBIs to take proper levels of price risks (see Section 6.3.2.9). The experience, sometimes, is not the indicator of success of risk-taking decisions but it seems to make RBIs more tolerant of decision results. It benefits RBIs in terms of their audacity in making decisions that seem to be advantageous and in seeing the results of a series of decisions instead of the result of just a single decision.

There are conflicts between RBIs who have different attitudes towards price movements. Those who are in the NR producing country may think that, if the NR prices are lower than the living costs of farmers, there will be a problem for the local economy in the long run, since NR producing is considered a monoculture in the South of Thailand (Jongrungrot, Thungwa and Snoeck, 2014). As a consequence, they may decide to take risks by holding NR stocks rather than hedging price risks by selling. It is worth noting that the majority of RBIs also own NR plantations. However, some RBIs admit that they are not reluctant to sell in advance if they think prices are going to fall. The possible explanation for this may be that they hold the view that their actions are independent of world market price movements.

With regard to age, the RBIs' attitude seems to change to desire to take less risk when they get older. This is consistent with the findings of Eddy, Roessali and Marzuki (2012), who said that the ages of farmers have a negative relationships with their risk taking intention. However, in practice, they are still forced to take risks even when they are

unwilling to. This is because of the nature of some businesses with high levels of price risks but with a lack of effective PRM tools. Furthermore, old traders might take more risks than the young in practices where they may have difficulty in learning and using modern PRM tools (Sikawa and Mugisha, 2013).

So far this section has focussed on decisions in risk taking. The next section details market channel selection in RBIs' business.

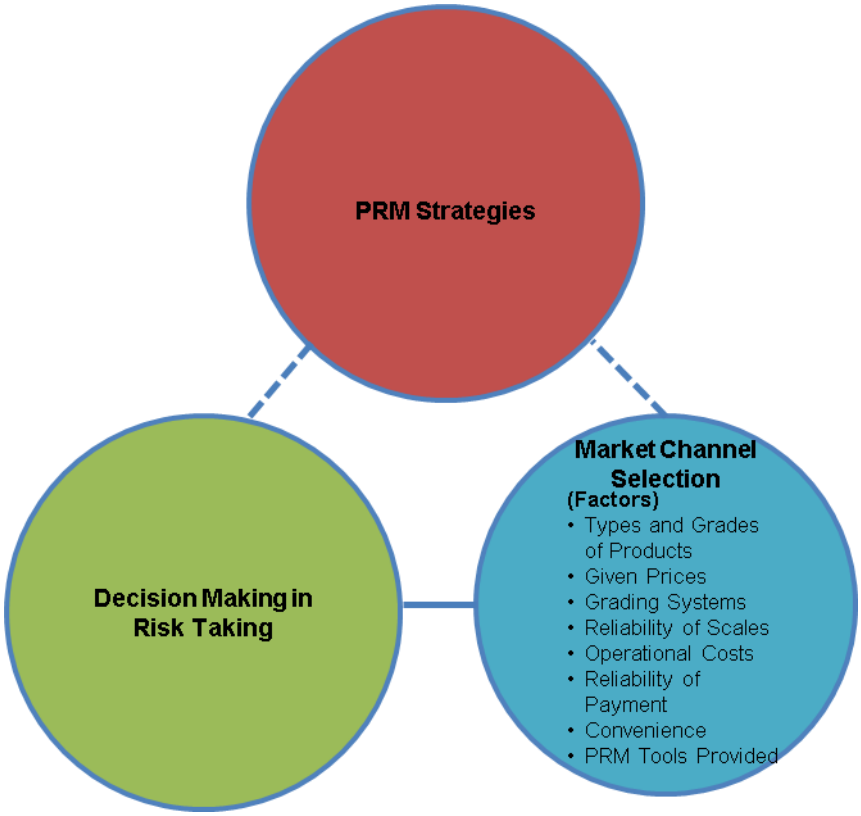


Figure 7.6: Factors influencing market channel selection of the proposed model

7.4 Market Channel Selection

Apart from when the NR should be resold as mentioned in the previous section, where they should be sold is another significant factor relevant to market efficiency as a whole, as the NR supply chain involves millions of smallholders. This is in line with Suksa-ard and Raweewan (2013), who noted that in NR's rival agricultural product, palm oil, production is dominated by small farmers as well. Therefore, there is the need for government agents (comparable to RBIs in NR markets) to design market networks, from plantations to processors to manufacturers, so that the market can become more efficient. In this research, the main market channels available for RBIs to choose from in order to market their NR product are direct sale to NR processors, auction markets, large

RBIs, ORRAF (see Section 6.4), as shown in Figure 7.1. The challenging task of selecting a market channel is to choose not only from different types of market channels, but also within the same types from a range of providers. Although the main purpose of choosing a market channel to sell an NR product is to make a profit in short term trading, some RBIs tend to balance it with other long-term benefits, particularly PRM purpose. Therefore, not only objective factors are considered in the decision, but some subjective factors are important as well, as shown in Figure 7.6.

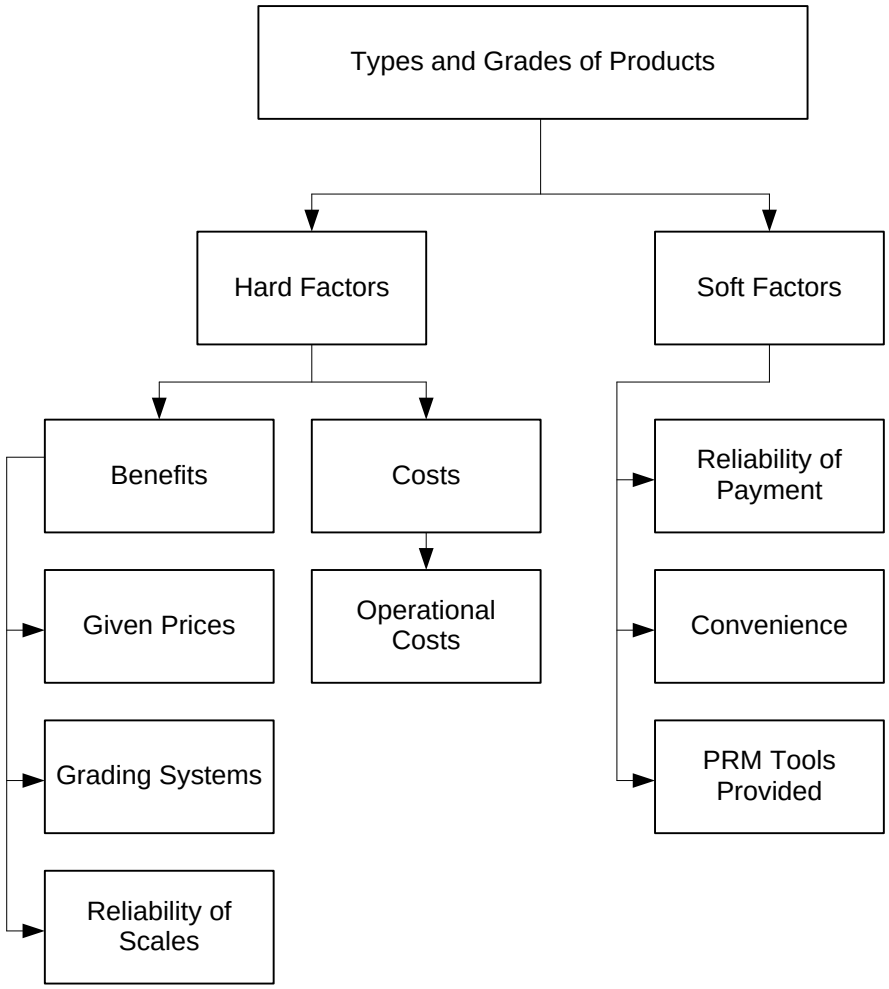


Figure 7.7: Market channel selection based on RBIs' perspective

Factors Influencing Market Channel Selection

A key factor, after RBIs made their decision to sell their products is choosing a market in which to sell amongst the alternatives. This is because it is common for RBIs to have multi-market channels through which to sell their products. The findings correspond with those of Nyaupane and Gillespie (2011), who said that some crawfish farmers had multi-types of market channels. Having several market channels through which to sell their

products allows farmers to enhance their incomes (Arinloye *et al.*, 2012). There are several factors that impact on RBIs' decisions in choosing a selling market channel, as shown in Figure 7.7. Firstly, the alternative markets are identified. Mostly, this stage is linked to types and grades of products. Then, the hard factors of benefits and costs of trading using the market channel are assessed. The benefit from trading is the derived net selling prices, related to given prices, grading systems and reliability of scales, whilst the cost is both fixed and variable operational costs. Moreover, soft factors, namely reliability of payment, convenience and provided PRM instruments, also play a crucial role in selecting the marketing channel through which to sell NR products. Figure 7.7 presented below, is the discussion of these factors.

- **Types and Grades of Products**

At the first stage of market channel selection, types and grades of NR products are the factors affecting choice (see Section 6.4.1). This is in line with Nyaupane and Gillespie (2011), who found that types of farm influenced market channel selection. It is clearly evident that different NR products have different alternatives of market channels through which they can be sold. This may lead to differently selecting marketing channels. Furthermore, within the same products, there are different grades, which are usually traded at different prices. As a consequence, choosing the right market channel to sell NR products, considering types and grades, plays a crucial role in RBI business. Additionally, it even plays a vital role in making the NR supply chain efficient.

- **Hard Factors**

The summation of benefits and costs which are able to be measured on a quantitative scale for each alternative market channel is the key decisive indicator in choosing a particular market in which RBIs can sell their product. However, the benefits of each have to be calculated, or judged, using the current offered price, how NR products are graded and how reliable is the scale from past experience. Finally, the end result from trading off between costs and benefits of each alternative is identified. The following is a discussion of the effects of each factor on market channel selection.

Given Prices

One of main factors which determine market channels through which to sell a particular type and grade of NR product is buyer-offered prices (see Section 6.4.2.1). Although the given price seem to be a comparable factor in selecting a market channel, in practice it is more complex when it is combined with grading and scaling systems in order to gain the

net price of products. Price seeking in RBI business is not unusual since their business is considered to be an opportunist. Therefore, querying price information from alternative marketing choices before the decision is made is important for RBIs. Although the given prices are an indicator of their business competitiveness, it needs to be incorporated with other factors, such as grading systems, scaling systems and operational costs, in order for RBIs to determine the final net selling prices.

Grading Systems

There is a slight difference in grading systems in each market channel but they have a significant impact for RBIs on their business results (see Section 6.4.2.2). This is because of the nature of the small profit margin of their business and it is traded in high volume. There are different grading systems in different NR products. Therefore, a grading system of some products is less or more reliable than others. A salient example of this is that of the grading of net content of cup lump with sight. Therefore, reliability and consistency of the grading system is one of the factors which influence decisions for the RBIs when selecting market channels.

Reliability of Scales

Scale reliability plays an important role in trading NR products (see Section 6.4.3). It can be a decisive factor of business when considering thin margins of profit. In order to calculate the net selling price, weight measuring also plays an important role in deciding which market channels to sell to, as recently the prices of NR have been considered high. Therefore, the reliability of scaling impacts directly on their trading results. It is surprising that the majority of RBIs complained about the issue of scale reliability even though the industry should have the standard measurement of control. This may be because lack of scale measurement precision allows some level of error to occur. However, it is possible that it may, as a weighing system, result in competitiveness, in terms of offering a higher buying price which could be considered as a benchmark in comparing competitiveness in the market.

Operational Costs

As well as the buyer-offered price, grading and scaling systems, operational costs also plays an important role in choosing the marketing channels (see Section 6.4.4). Peng and Yu (2014), suggested such costs could be divided into fixed and variable costs and that they are different from business to business. In this research, labour costs are fixed whereas transportation costs are variable according to distance. As a consequence,

such transports costs make the total operational costs different. This confirms the findings of Sikawa and Mugisha (2013), who found that milk producers were sensitive to transport costs in selecting market channels. It is important to note that latex supply chains are similar to those of milk in terms of short shelf life of products and rely heavily on product transportation. The distance to the market and in some cases, the payment for a hired driver has a bearing on the fuel costs. Moreover, the impact may be higher when the transport is not full to capacity. This is unsurprising because the cost per unit will be significantly different in the case of a lower unit per delivery.

- **Soft Factors**

In addition to hard factors, soft factors also play a crucial role in market selection. These are payment reliability, convenience and offered services relevant to PRM tools. Eventually, the final decision in choosing a particular market is made based on the balance of such hard and soft factors. The discussion of each soft factor is as follows:

Reliability of Payment

Counter-party risk is also one of the main factors for choosing market channels apart from net given prices and operational costs, since it is the main issue in trading NR as the market is subject to price volatility (see Section 6.4.5). In many cases, fraud occurs when free riders offer buying or market prices in order to attract the victim. However, perhaps it is unsurprising that the unintended default of business partners occurs as a result of their losses and bankruptcy, since it is a high risk market if not properly managed. Moreover, it is not easy to assess the counter-party risk as no public information is available for the majority of them, especially Tier 1 RBIs. It is worth noting that, out of hundreds of them, only three NR processors registered as public companies in Thailand. Therefore, RBIs tend to prefer market channels which can be trusted for payment, in the form of immediate cash or quick bank transfer payments. This is consistent with the work of Sikawa and Mugisha (2013), who found that milk famers were likely to choose market channels that paid in cash whilst they considered that the market channels which paid with credit were unreliable.

Convenience

It is usual if RBIs decide not to sell to the market channels that potentially allow them to maximise the profits, to explain that this is because of the convenience factor (see Section 6.4.6). This is in line with Amaya and Alwayng (2011), who pointed out that travelling time and product volume affect farmers' decisions to sell their product to better,

but distant, markets. In NR trading there are still many issues that seem to be uncontrollable, such as the products being stolen during transportation. Moreover, sometimes the distant market may not just result in higher costs of transportation, but a longer time-scale and a delayed cash flow. Therefore, choosing the market that is suitable for their business conditions is considered common in NR trading.

Provided PRM Instruments

Individual Market channels can be considered more than a goods exchanging place (Yunus and Syahputra, 2013). In this case, it also links to a PRM tool provider. It is believed that such tools play a vital role in business competitiveness in trading NR, particularly during periods of falling prices or price volatility. Therefore, it is unsurprising that some RBIs choose the market channels that allow them to have the advantage of hedging price risks in the longer term rather than for short-term profits (see Section 6.4.7). This usually occurs in RBIs' processing business since they are exposed to high price risks from time lags in processing. This is consistent with the findings of Maples *et al.* (2013) who found that cattle finishers relied not only on the subtraction of selling prices and costs of input: feeding and buying prices, but price movements as well. Hence, they sometimes needed the tools to lock the margin from price movements as they affected both input raw material costs and selling output prices. However, latex RBIs seem to be less dependent on these factors as they trade on a daily basis.

In the section that follows, seven perspectives that influence price risk exposure in the context of RBI business will be discussed.

7.5 Price Risk Management Environment

To gain insight into the price risk context of an RBI business environment, seven aspects of PRM were investigated in this primary research. They are the availability of PRM instruments, selling market channels, the price information, the pricing and price forecasting methods used and the use of a futures market and technology. The results of this study were shown in Section 6.5. More details are subsequently provided in the sections below:

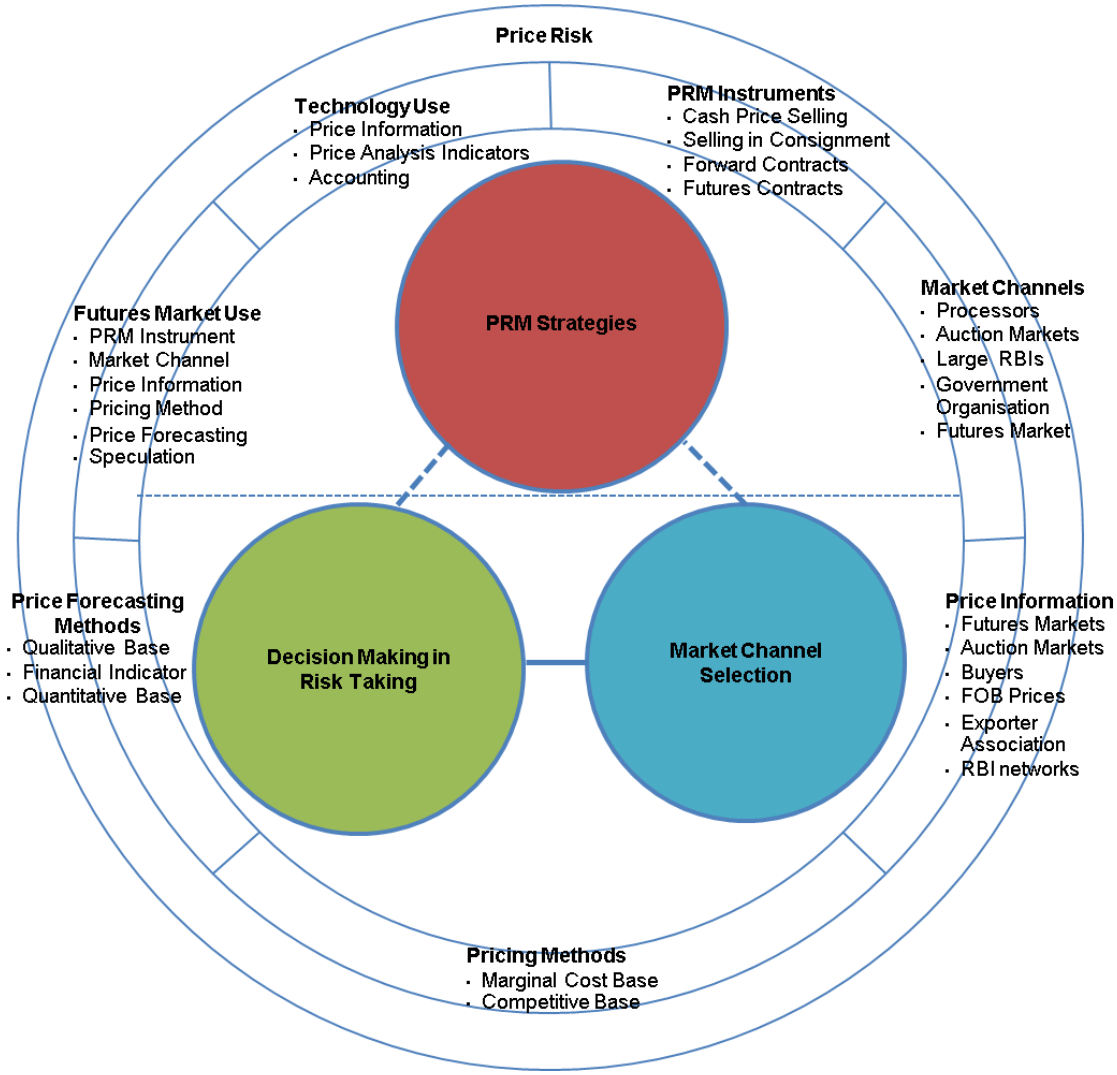


Figure 7.8: Price risk environments of the proposed model

7.5.1 Price Risk Management Instruments

It is clearly evident that PRM tools play an important role in PRM strategies of RBIs (see Section 6.5.1). This finding is consistent with that of Rasmussen, Madsen and Lund (2013), who stated that risk management is considered complex and that the available tools have a part to. This is because some PRM strategies require particular tools to be implemented. Moreover, the PRM tools also link to decisions in risk taking because the ability to access PRM tools means a capability in hedging price risks. The result is also complemented by Behar (2011), who said that accessibility to an effective PRM tool results in better benefits of trading. It is also appears that the PRM tool plays a role in choosing market channels through which to sell their NR products. Some RBIs need them for the long terms benefits of managing price risks from the tools provided by the particular market channel. In this research, it is found that there are four main PRM tools

being used by RBIs, cash market, selling on consignment, forward and futures contracts, as shown in Figure 7.8. The discussion of details is as follows:

- **Cash Price Selling**

Cash or spot price selling is one of the most popular marketing methods in the Thai domestic NR market (see Section 6.5.1.1). One of the reasons is that it allows any RBIs who hold NR stock to sell their products without considering the size of previous trading records as it has no need of PRM tools relevant to a market credit. As a result, RBIs who are novice or small are capable of accessing this market. Moreover, cash price selling is also widely available in the main trading market channels, i.e. processors, auction markets, large RBIs and ORRAF. The cash price selling helps RBIs to manage price risks by selling their stocks or buying and reselling NR products immediately (in some NR products such as USS and latex).

However, price risk in cash price selling seems to be less manageable relative to other tools. The finding is consistent with that of Blank, Saitone and Sexton (2014), who stated that a cash market is not effective in terms of PRM of suppliers. Nonetheless, buyers, usually, offered buying prices higher than those of forward or selling on consignment contracts. This accords with Neyhard *et al. (2013)*, who found that cash markets usually offer a higher price in trading milk than the other market channels. This contrasts with the findings of Williams and Malcolm (2012), in wheat markets where cash market are traded at a discount in the harvest season. This may be due to the fact that NR production tends to be all year round like milk, rather than a seasonal crop like wheat, although latex yield varies at different periods of time year-on-year.

- **Selling on Consignment**

Apart from stocking in RBIs own warehouse, selling on consignment is another PRM tool for price enhancement. Selling on consignment in the NR market is usually provided by some processors or large RBIs who trade USS and cup lump (see Section 6.5.1.2). This tool is also found in the coffee market in Uganda in which sellers are responsible for price movements whilst the coffee has already been used by buyers (Newman, 2009). Even though RBIs are able to gain an advantage from reducing the risk of NR product quality deterioration and other risks relevant to stocking them and retain the ability in price speculation, it may lead to an issue of conflict of interest. This is because what RBIs gains from price speculation may imply the loss of their business counter-parties if they do not transfer the price risk they received properly. Moreover, they may lose market power to buyers as the buyers are the price makers of buying prices. It can

become a serious loss during market price collapse which has occurred more often in recent years.

It is worth noting that RBIs who use selling on consignment require a higher cash flow than those who do not since they need to stock their products. However, their cash flow requirement tends to be lower than those who stock their own physical product as they may receive payment of some portion of the total value of their selling products. As a result, RBIs may leverage their capital by using this tool to gain larger trading capacity.

- **Forward Contracts**

A forward contract is a key PRM instrument in trading NR in the Thai market (see Section 6.5.1.3). This corresponds with the view of Newman (2009), that forward contracts are commonly used by local coffee exporters. Though it is arranged in an informal way which may be at risk of contract defaults, it is helpful in hedging price risks in trading during price fluctuation or periods of decline. This accords with the argument of Williams and Malcolm (2012), that the forward contract is a tool used by the user to lock a satisfactory price in early, rather than hope for expected better prices later. However, it is criticised by Newman (2009), who said that the tool does not allow users to gain an advantage from increasing prices.

It is worth noting that there was a period of NR price downtrends in the past few years. Therefore, the forward contract becomes even more important in this period. However, forward prices in commodity are offered by buyers (Blank, Saitone and Sexton, 2014). This may be because they need to transfer price risk to another party with the opposite market position (Taylor, Tonsor and Dhuyvetter, 2013). Therefore, just some RBIs who tend to have a market credit are able to get access to this PRM tool. As a consequence, some starting-up businesses or RBIs are left exposed to the price risk.

- **Futures Contracts**

Regardless of the market power required in NR forward contracts, futures contracts are standardised contracts equally accessed by any RBI. The tool helps users to protect themselves from price declines during production periods (Taylor, Tonsor and Dhuyvetter, 2013). However, it requires some basic knowledge and some level of available finance to maintain these contracts. In addition, the finance to maintain the contract may be considered to be high (Neyhard *et al.*, 2013). Perhaps these issues will be resolved by more training sessions in futures trading.

Nevertheless, one of the big issues in trading is the futures market itself. Its main problems are a lack of market efficiency and the domination of a few big traders; problems that seem to be difficult to solve. This finding is consistent with what Broll, Welzel and Wong (2013), who suggested that the real futures exchange tends to be imperfect. Its ability in hedging price risk may vary from time to time (Yaganti and Kamaiah, 2012). This is complemented by Taylor, Tonsor and Dhuyvetter (2013), who indicated that futures hedgers avoid facing price risk, but they, instead, may be exposed to a basis risk of a changing gap between futures and physical prices which, in turn, results in gains or losses from hedging. Shackleton and Voukelatos (2013), suggested the need for testing the hedging performance when the market turns volatile.

One of the factors affecting market inefficiency may be from government intervention (Aggarwal, Jain and Thomas, 2014). This is true in the Thailand NR market in which the Thai government occasionally has intervened (see Section 6.5.1.4). However, a consequence of the intervention from government may be that some traders are no longer willing to hedge price risk using futures markets (Ranganathan and Ananthakumar, 2014). All in all, it could be contended that, without these problems, futures contracts will be the most useful PRM tool for all NR supply chain players, not just limited to RBIs, to manage price risks in their business (see Section 7 in Appendix U).

- **Options Contracts**

Even though options contracts seem to be highly beneficial for RBIs, as they are considered to be NR stockholders, they are, unfortunately, not available in NR industries in Thailand. This PRM tool appears to be an effective one for protecting them from losses during periods of falling prices. This is considered from the options' performance in the financial market (Shackleton and Voukelatos, 2013). In addition, it requires a low premium payment which allows small traders to participate in the market (Ghosh and Dey, 2013). This was agreed by Neyhard *et al.* (2013) but they were concerned with a low-return issue when it is used in dairy markets.

7.5.2 Market Channels

Five markets channels were found to be available for RBIs to sell their product (see Section 6.5.2), as shown in Figure 7.8 whilst, perhaps, delivery to futures market has never been used by RBIs. The market channels available to RBIs may be one of the indicators to identify a price risk in a particular commodity market, as a particular market implies market power between sellers and buyers, and sometimes the level of price

hedging ability. This is in line with that of Yunus and Syahputra (2013), who found that in rice markets the selection of a particular market channel to sell rice impacted on selling outcomes. The following is a discussion of market channels in selling NR of RBIs.

- **Direct Markets to Processors**

The majority of NR products are sold directly to processors even though their offered prices seem to be lower than those of auction markets. The main reason may come from the advantages of more integration to NR supply chains of accessibility to PRM tools and market information. It is important to note that processors may provide all three major PRM tools in NR markets: cash price selling, selling on consignment and forward selling. However, such PRM tools are likely to selectively provide to RBIs who are financially sound.

Another reason why this market channel became popular is, perhaps, the flexibility in negotiation of trading both grades and prices. This appears to match the needs of RBIs who trade NR products which are diverse in terms of these specific biological properties. Therefore, the negotiation in trading prices to match product grades seems to be inevitable. Apart from the assistance of PRM, some processors facilitate price speculation for their customers as well. For instance, the availability of selling on consignment supports RBIs in stocking their products without the concerns of quality deterioration, or safety issues. However, there is an issue of losing the market power of RBIs from buying price setting of processors which may lead to a conflict of interest, especially during sinking price periods.

- **Auction Markets**

Although auction markets play a vital role in terms of price benchmarks of NR trading, the volume of trading via these markets is low relative to the size of the market. The possible explanation for this may be explained by the following reason. The auction markets are well-known in trading in high quality products. As a consequence, the majority of NR products traded do not meet the criteria. Additionally, there is an issue for the market capacity of trading caused by the limitation of the infrastructure. Moreover, the mechanism of selling involves the uncertainty of offered prices as sellers have to sell before the derived selling price is set. Therefore, it seems to be too risky for trading in high volumes. It is important to note that except from providing cash selling in auction markets, they play a limited role in providing PRM tools relative to NR processors.

Recently, in terms of PRM tool providers, in addition to cash selling, some auction markets have introduced formal forward contracts to buyers and sellers. This appears to be a good first step towards sustaining NR markets in the futures, although they have some limitations in practices regarding selling and delivery time of contracts. It seems to be most beneficial to RBIs who add value by processing latex into rubber sheets as they are exposed to both price risks and a basis risk between latex and rubber sheet prices. However, despite the introduction of forward contracts, auction markets tend to be popular amongst market channels for Latex-RSS processors. The possible explanation for this is that they are likely to produce NR products that meet the market standard requirement. As a result, they can be sold at a good price via auction markets.

- **Large RBIs**

Large RBIs play a crucial role as a market channel in NR trading. Not only may they gain an advantage of better selling prices from their market power in negotiation, but they also play a role as a provider of PRM tools. It is believed that such PRM tools are attractive to small or novice RBIs who are unlikely to get them from processors. Latex-USS and Latex-RSS RBIs, who really need them to support their businesses that, normally, generate profits from value added. Nevertheless, there is an issue of a counter-party risk depending on whether they are able or intend to transfer the price risk from their trading to other parties. As a consequence, it is unsurprising that there were many cases of contract defaults or no payment of NR trading with large RBIs during unfavourable price movements relative to their trading positions.

- **Government Organisation**

It is not unusual that RBIs decide to sell their NR product to government organisations as they usually gain benefits from the government support, particularly during the price intervention scheme. Although it is not a main market channel for RBIs, they sometimes need to use it to save their business from unfavourable circumstances, or sometimes even gain an advantage from better prices. It is a widely held view that there is an inconvenience issue with using this market channel, such as a grading system that seems to be strict and that payments are usually delayed. Therefore, RBIs tends to prefer to use other market channels during normal market circumstances.

- **Futures Markets**

Not only does Thailand futures exchange market, AFET, provide a price hedging function to market participants, it has a function of delivery of NR products according to a futures

contract as well. However, it is believed that it has never been used by RBIs. This finding is in line with Blank, Saitone and Sexton (2014), who found this when studying a cattle market. A probable explanation is that the size and specification of its contract are not matched with RBIs' product traded. Moreover, the delivery location may be inconvenient to them as they are located in central Thailand whereas the main NR producing area of RBIs in this study focusses on southern Thailand.

7.5.3 Price Information

It is a widely held view that price information plays a vital role in trading NR since many decisions in trading activities are in relation to it (see Section 6.5.3). There are different sources being used by RBIs, as shown in Figure 7.8. Perhaps, the most important price information for RBIs is the buyer-offered prices. This represents the immediate selling price to a particular buyer and it may reflect on RBIs' buying prices after subtracting it with operational costs and required profit margins. However, it is not always the case because RBIs may consider it less competitive when their offered buying price is relatively low compared to their competitors. It takes place when farmers have access to price information as well (Mitchell, 2011) which, in turn, leads to increased market power (Amaya and Alwayng, 2011). Hence, it is not unusual for some RBIs to have several business partners in order to gain advantages in price information and selling prices. However, they need to constantly supply their business partners, resulting in the limitation of the number of buyers that they are able to trade with. As a consequence, other choices of price information are broadly used in NR markets.

As a result of a competitive market, RBIs may ignore price signals from their business partners by using competitive pricing instead. Therefore, more open price information sources such as futures and auction prices play a crucial role in NR trading. Prices in auctions markets are well-known throughout all market participants in the Thai domestic market, ranging from farmers to RBIs to processors. Although farmers are usually used as the reference in negotiating prices in selling their products, these prices, sometimes, seem to be too high for RBIs to buy the NR product, as they need to reduce some operational costs and increase the profit margin. It is worth noting that the auction prices are derived from the sealed first-price auction for the whole NR traded on the day; therefore, they may not represent the actual demand of their business partners to whom they resell it. As a consequence, it is risky for RBIs to buy the products at the high price of a single, highest-demand buyer.

Apart from price information from futures markets, auction market prices, FOB prices, prices from the Exporter Association and RBI networks are considered to be supplement sources to incorporate into their trading decisions. Therefore, in accordance with a range of price information, RBIs' market power to negotiate with their buyers is considered high. However, they seem to be a price taker, rather than price maker, in the market. Without proper PRM tools, they still face with the risk of dropping prices where price makers may consider it as an option to force them to sell their stocks.

RBIs seem to be enthusiastic in seeking price information to incorporate into their decisions, unlike some wheat farmers that tend to not be aware of the importance of price data and its analysis for decision making (Williams and Malcolm, 2012). However, they are searching for new analysis methods which are effective in response to the market becoming more volatile. For example, some of them applied to futures market brokers to gain more up to date price information in order to take an advantage in physical trading and some are learning technical graph analysis or consulting experts, even though its effectiveness is still questioned.

7.5.4 Pricing Methods

It is clearly seen that RBIs are considered to be price takers of what is offered by their buyers (see Section 6.5.4). However, they have some market power to negotiate prices with their buyers. This is in line with Arinloye *et al.* (2012) who found that pineapple famers were able to negotiate selling prices, even though they are price takers.

In contrast, RBIs play an active role in setting buying prices. With regard to the buying pricing methods, there are two main methods practiced by RBIs: marginal cost and competitive base methods, as shown in Figure 7.8. The price reduction from benchmark prices, the marginal cost base method, is a main pricing method used widely by RBIs, even though the benchmark prices referenced by RBIs tend to be diverse: ranging from auction, to buyers' offers, to futures, to FOB prices. Auction prices are popular as references to price information and are well-known by supply chain participants, especially NR farmers.

However, many RBIs complained that auction prices, sometimes, may make it difficult to negotiate with farmers, particularly during periods of price fluctuation, as the prices represent the high quality NR grade. This eventually forces some RBIs to adopt a competitive base pricing method. This finding confirms those of Mitchell (2011), who found that business intermediaries are likely to make better offered prices to farmers who gained price information. On many occasions, those prices are higher than they are able

to get from NR processors. The competitive pricing method is widely used by RBIs and it is an undeniable fact that the RBIs are exposed to a high price risk if they do not manage it properly. A possible reason for this may be because using similar buying prices to those of competitors is more convenient than calculating their own (Ingenbleek and van der Lans, 2013). As a result, it forces them to operate the business with low profit margins, sometimes with losses and rely mainly on speculation. This finding is in contrast with that of Newman (2009), who found that business intermediaries are able to maintain profit margins high enough to cover price volatility in the coffee supply chain. A likely explanation for this is the different levels of market competitiveness between NR and coffee markets.

Actual selling prices are from buyers' offered prices. Therefore, the reduction of offered price as buying price is widely used. However, regarding business competitive issues, prices of futures or exporting markets are not uncommonly used as a price benchmark. Nevertheless, they are critiqued by some RBIs in that the prices seem to have asymmetric movements relative to the buyers' offered prices. This is consistent with that of Shisanya *et al.* (2013) who found asymmetric price transmission in food supply chains.

7.5.5 Price Forecasting Methods

From the findings in the previous chapter, qualitative price forecasting methods and financial indicators are found to be used by RBIs, whilst advanced quantitative methods are indirectly used by some RBIs via price analysis of a government organisation (see Section 6.5.5), as shown in Figure 7.8. Qualitative forecasting methods are the most popular price forecasting methods used by RBIs. They use their experiences accumulated over years to build their intuition in judgement. However, it seems not to be highly effective in the current business circumstances which are likely to be volatile.

The time horizon of price forecasting is considered short on a daily basis. The RBIs who are active in price forecasting rely largely on financial technical tools. Although they are at the beginning of using them and their performances are still questioned, some RBIs believe such tools have a potential to be a solution of price management.

Scientific price forecasting methods are used by none of the RBIs who participated in this research, although one of them mentioned the usefulness of using the results from the website of RRIT. A likely explanation for this may be the complexity of building the methods. This is in line with Getnet *et al.* (2011) who mentioned that price forecasting is considered too expensive for a single farmer; therefore, there is a need for some

institutions to provide it. Another probable reason of not using the scientific methods for price forecasting by RBIs may be a lack of the acknowledgement of their benefits.

7.5.6 Futures Market Use

Futures markets contribute to NR trading in several aspects, as shown in Figure 7.8, mostly in terms of price information, price forecasting, price risk hedging, pricing benchmarks and speculation (see Section 6.5.6). This accords with the outcomes from Revoredo-Giha and Zuppiroli (2013) who indicated that futures markets are used for hedging price risk, forming trading prices and investment purposes. RBI businesses, using them as price information, perhaps, is the most important part as RBIs need to make decisions on a daily basis on setting buying price, selling or stocking. Therefore, these decisions are the key factors in deciding the extent of their profits or even losses on some occasions. However, in terms of a price benchmark, some RBIs may misinterpret the physical market price signal from using the price in futures markets as a price indicator. This is a consequence of an asymmetric price transmission between the price in the futures and physical markets which usually occurs in the commodity market. The visibility of this volatility is consistent with that of Taylor, Tonsor and Dhuyvetter (2013), who pointed out that a basis risk between futures and physical markets has increased and that it has impacted on futures market users. Perhaps, this is the result of the differences in market circumstances between the two; or sometimes it is from the currency exchange rate changes as the main futures market are trading in different currencies in foreign markets.

A basis risk also plays an important role in cross hedging. It is an undeniable fact that the types of products and standard grades of NR products listed in futures markets are usually different from those in physical trading. As a consequence, price risk hedging relies mainly on the constancy of a basis risk between different product prices. Adams and Gerner (2012) pointed out the need to identify the proper commodity in futures markets for cross hedging. The basis risk plays a key role in particular commodity identification.

Although using a technical graph of futures market price movements can forecast futures prices at some levels, achieving the precision level of RBIs' trading is still a challenging task since their trading margin is very thin. Therefore, a small price forecasting error may change profits to losses during the periods of high price fluctuations. Nevertheless, using technical analysis seems to be beneficial during periods of price trends. There are obvious advantages of price following stocking NR products when prices are in uptrends,

or, in contrast, selling them in advance when prices are in downtrends. It is important to note that futures prices are rarely directly used as price prediction. This may be because its performance is low as found in the work of Revoredo-Giha and Zuppiroli (2013).

Although one of the purposes of establishing the agricultural futures exchange is to be a PRM tool (Radetzki, 2013), it is rarely used for this function by RBIs. However, they utilise the futures market for many purposes in a passive role, such as price information, price benchmark in setting buying prices or negotiating selling prices. Even though some RBIs participate in trading in the futures markets, they mostly use them for speculative purposes. This is because of a variety of barriers to using them in price hedging.

One of the barriers to the use of the domestic future market, AFET, for hedging is illiquidity. This is common in the commodity exchange market in emerging countries. It may be the consequence of a lack of the balance of market players in the market: hedgers, buyers, sellers and speculators. Additionally, it may be because of the domination of just a few big traders which may lead to the potential of market manipulations, which, in turn, may result in repelling other traders from participating in the market. This is in line with the views of Cai, Stiegert and Koontz (2011), who found empirical evidence of the enhancing market power of Oligopsony packers in the beef industry.

The effective, active futures markets located in a foreign country are inaccessible or highly risky to access via an informal process. It is evident that there is an issue with the inefficient market of AFET from RBIs' point of view. This issue was also highlighted in the work of Boonyanuphong and Sriboonchitta (2014), although Romprasert (2011), found in 2008 that it was efficient. This may be because the market has significantly changed in recent years. Moreover, the management of one thing may result in other issues. Dealing with price risk in futures markets in other countries is related to the volatility of the currency exchange rate and the informal process of trading may lead to the issue of frauds. Therefore, the trade-off between prices and other consequent risks from managing it is an issue to be considered for RBIs when adopting futures markets as a PRM instrument.

7.5.7 Technology Use

The research findings reveal that technology is used by RBIs for their business for three main purposes: gaining price information, speculating prices and accounting (see Section 6.5.7), as shown in Figure 7.8. Technology impacts on RBI business mainly in terms of price transmission in the NR market, both in positive and negative ways. On the

one hand, on the positive side, the availability of technology allows easy access to price information and results in more market power of RBIs to negotiate in selling prices to their buyers. On the other hand, some basic, cheap communication technology, such as mobile phones, is also available to farmers. Therefore, the farmers gain more market power to sell their NR products as well. As a consequence, the NR market, in general, become more competitive. This market competition sometimes forces RBIs to trade with low margins or even losses in some cases and instead, take more price risks in order to gain enough profits to maintain their business competitiveness. All in all, the high competitive market and lack of availability of effective PRM instruments for RBIs make RBI business more vulnerable to price movements.

Technology is involved in RBI business in several aspects and is mostly relevant to NR prices. In terms of price information, the increase in accessibility of price information leads to better incomes (Mittal and Mehar, 2012). They are used for directly accessing the website where price information is available, or for discussing price movements with their RBIs networks via a discussion board. Furthermore, some RBIs may participate in futures market to trade futures contracts via particular software provided by brokers. It is worth noting that even though some trade in the futures market, the majority of such trading is for speculation. This may be because of the inefficiency of the market which, in turn, is a main barrier to its use as a PRM tool.

Another purpose of technology usage is for marketing decisions, particularly price forecasting via websites or the software. This corresponds with Jensen (2010), who indicated that technology used in communication impacts on decision makers (farmers) on selling agricultural products in emerging countries. As RBI business is sensitive to a small price movement, applying the price forecasting technique of momentum indicators, such as MACD, RSI, and STO require some specific software. This allows them to leap-frog the technology used by financial traders who seem to be dominant in the NR futures market as price makers. However, some RBIs admitted that using it in a passive way may not sustain their business in the long term as its performance is not high. In other words, they use it just because they want to survive rather than triumph.

Regarding using technology in management, it is surprising that there is no particular decision support or business intelligence systems used in the RBIs business. Some of them may use it for basic accounting in their businesses, even though the majority of them use the traditional technique of a calculator and notebook. The reason for that, perhaps, is because the process of business is not complex, relying on buying and reselling. Although the processing RBIs seem to be more complex in management, their

size of business is small. In addition, PRM mostly depend on informal methods. Therefore, the benefits of relationships management appear to be dominated by those with the management software that have the main purpose of profit maximization.

So far this chapter has discussed PRM strategies, risk taking decisions, market channel choice and the price risk exposure circumstance. The next section will demonstrate the relationship of the first three elements based on a strategy process: formation and implementation, in order to manage price risk in practices in the context of RBI business.

7.6 The Linkages of PRM Strategies, Decisions in Risk Taking and Market Channel Selection

In this research, PRM in practice can be divided into two main stages based on a strategic management process (Mintzberg, 2003); PRM strategy formation and implementation. In the implementation stage, it includes two important activities of decision making in risk taking and market channel selection, as shown in Figure 7.8. The formation of PRM strategies of a particular type of RBI business are based on their experience, knowledge, resources, market power and business characteristics. This business depends mostly on the knowledge gained from their own experience as they lack formal training or education linked directly to their business activities. However, there is evidence that some RBIs' knowledge was transferred from previous generations. Moreover, although there are some training sessions relevant to PRM using AFET, they seem to be inadequate for meeting the needs of the RBIs.

In the stage of PRM strategy implementation, they are divided into two essential activities: making decisions in risk taking and choosing the market channel to sell their products. In the activity of making a decision either to hold the stock, hedge the price risk or sell NR products in advance, RBIs based their decisions mainly on the market situation they perceived and the alternative choices of decision available to them. The bigger businesses tended to have more alternatives than the smaller ones. In addition, this decision is likely to be the key factor in determining their business performance; whether gains or losses. This explains why RBIs who adopt the similar PRM strategy result in different business performance. Moreover, it can be used to clarify the uncertainty of the industry that leads to the difficulty of identifying a champion PRM strategy.

The other activity of implementation apart from decisions in risk taking is the market channel selection process. This stage determines the advantages of relative markets where, or amongst NR buyers, to whom they have are potential to sell. In spite of the

operational factors, RBIs are inclined to base their decisions on the convenience of transport and the PRM tools that buyers provide for them. This is mainly because, on many occasions, the maximisation of their profits from hard factors, such as product grades or product weight, are difficult to control since the standard of market is still vague.

7.7 Chapter Summary

This chapter has discussed the main research findings relevant to PRM practices. The discussion is structured based on four major components: PRM strategies, risk-taking decisions, market-selection decisions and price risk circumstances (see Figure 7.1). These four elements ultimately formed a conceptual model of understanding in PRM practices based on the context of RBIs' perspectives in the south of Thailand. The model is considered as a main contribution to this research since it addresses the research aims stated in the introductory chapter. Apart from the exploration based on the four main elements, this model also includes the factors influencing PRM strategy formation, decision making in hedging and market channel choice.

One of the research contributions is the management framework of a PRM strategy in agricultural commodity trading. This framework is demonstrated by the linkage of PRM practice of PRM strategies, decision making in risk taking and market channel selection based on strategy formation and implementation. The first stage of PRM practice is the PRM strategy formation. The second stage is the PRM strategy implementation which is divided into two key activities: decision making in risk taking and market channel selection. Risk-taking decisions concern the decision to sell or to stock physical products, or hedge or speculate on prices from PRM instruments. The other activity of selecting the market channel is to make transactions based on selling physical products. It involves identifying the availability of market channels and making decisions based on the hard factors of costs-benefits and soft factors of reliability of payment, convenience and PRM tools provided.

Another contribution to knowledge of this research is the decision framework with regard to market channel selection. It comprises the types and grades of NR product identification and then considers the trade-off between hard and soft decision factors. The hard factors consist of net selling prices derived from offered prices, grading and scale systems and optional costs, mostly depending on transport and labour costs. The soft factors include payment reliability, convenience and the provision PRM tools.

The following chapter concludes this research. The main findings, the contributions to knowledge and the research implications are highlighted as the key outcomes of the study. Recommendations to the NR Industry are provided. The limitations of this research are also considered. Then, recommendations for further research are outlined. Finally, the researcher reflects on how the research was conducted.

Chapter 8 Conclusions

8.1 Introduction

Though commodity prices have received more attention from many researchers, policymakers, governments and practitioners in recent years due to their volatility, the majority of them focus on the implications on traders, producers and consumers. To date, the research in price risk and PRM in the context of intermediaries, especially in an agricultural commodity in emerging countries, has been under researched. NR is one of the main exported agricultural commodities in Thailand (Weerathamrongsak and Wongsurawat, 2013; Soontaranurak and Dawson, 2015). The NR industry involves millions of small producers, and as a consequence, RBIs play a crucial role as a link in the supply chain. Therefore, the efficiency of their business management affects the supply chain as a whole.

This research investigated the implications of price risk to RBI businesses and its management practiced by RBIs under the research question *"How do rubber business intermediaries manage natural rubber price risks, taking into account the volatility of prices in Thailand?"*. To address the research question, a qualitative research approach is adopted in this research in order to gain in-depth data relevant to the issues of price risk implications and how to deal with this price risk. Twenty four RBIs from five categories of trading businesses located in seven southern provinces, the main NR producing area in Thailand, were selected based on the snowball sampling method so that relevant data can be gained. The consent-informed, ethical semi-structured interviews and the personal profile and business demographic questionnaire were conducted in the south of Thailand during June and July 2013. The thematic analysis was chosen to be the analysis method; the NVivo 10 software was used to make organising and revising easy to do. The use of thematic analysis provided a systematic and rigorous assessment of the interview data. As a result, this research proposes a conceptual model of PRM practices in commodity trading in the context of a high volume, low margin market, taking into account price volatility.

This concluding chapter is divided into seven sections. The first section, Section 8.1, is a brief summary of the research. This is followed by Section 8.2, containing the main findings. In Section 8.3 the research's contribution to current knowledge and its implications to practices in NR supply chains are clarified. Various recommendations to the Thai NR industry are given in Section 8.4, followed by the limitations of the thesis in Section 8.5. In Section 8.6 further research is recommended for other researchers to

carry out. Finally, Section 8.7 considers the self-reflection of the researcher on this research.

8.2 Main Findings

Returning to the research question posed earlier in this study, it is now possible to state that the research question, as mentioned in the previous section, is addressed according to the achievement of the four main objectives of this research (see also Section 1.4). In this section, the achievement of the individual research objectives will be demonstrated one by one.

1) **To explore PRM strategies adopted by RBIs in order to manage their business, taking into account price volatility.**

The first research objective was concerned with what PRM strategies were adopted by RBIs in the south of Thailand to manage NR trading, taking into account the fluctuation in prices. In order to achieve the objective, the two main amounts of primary data were obtained from semi-structured interviews and the pre-interview questionnaire. These were analysed by combining them with the information relevant to the price events gathered from the documents. In this analysis, the thematic analysis method, template analysis, was utilised in order to achieve the findings.

The findings show that more effective PRM strategies tend to require more advanced PRM tools. For example, the portfolio management strategy needs a proper warehouse or sales involving consignment contracts, forward contracts or futures contracts. The stocking strategy is highly exposed to the risk of falling prices and needs proper warehousing in order to store NR products to reduce a risk of product deterioration. This research also found that PRM strategies are fragmented amongst and within the types of RBI businesses that are categorised based on the product they sell and/or process. The main reason for explaining the different PRM strategies that the different RBI types adopted is due to their supply chain structure. Business sizes and resources, and personal knowledge in PRM, are the key factors that indicate why the strategies vary within the same types of RBIs.

The research findings reveals that there are different PRM strategies adopted by RBIs, including stocking, back-to-back selling, pricing in advance, negotiation, portfolio management, alternative product marketing and adaptability. The summary of individual strategies is as shown below.

According to the research findings, stocking is one of the main PRM strategies adopted by RBIs. This results from the fact that the nature of NR trading (with the exception of latex) is time consuming, involving such activities as processing, grading and transport, before being resold. Thus, to manage price risks, RBIs need effective PRM tools. However, the PRM tools available in the market seem to be insufficient, and exhibit some barriers when it comes to accessing them (such as informal forward contracts requiring market power resulting from trading relationships or volumes). As a consequence, some RBIs, such as small or novice traders, are unable to use such tools. Moreover, price speculation resulting from stocking is considered common (sometimes in RBIs' favour) in NR trading. Some RBIs may have market power, but may decide to stock NR with the expectation of higher profits in future. Some RBIs even use the selling on consignment (delivering NR to processors but delaying in selling it) to speculate in terms of price by stocking. It is also evident that this strategy has provided good performance due to the long period of NR price uptrend due to the commodity boom. However, the stocking strategy is a concern when the price trends are downwards.

Back-to-back selling is a riskless trading strategy. It dominates the business of RBIs dealing in latex as it is traded on a daily basis. However, other NR product RBIs, namely cup lump, USS, Latex-USS and Latex-RSS, can adopt this strategy by using PRM tools such as forward contracts, although there seems to be a limitation in terms of the availability and accessibility of effective PRM tools on the market. Moreover, one of the motivations for using this riskless strategy is related to RBIs in locations that have less competition as they can make immediate profits from trading. Conversely, some RBIs in high competition areas cannot adopt this strategy since they have to speculate in terms of price to generate profit. It is worth noting that according to the findings, the NR market in the south of Thailand is considered highly competitive based on the RBIs' perspective. Therefore, the majority of them are forced to adopt more risky PRM strategies, such as stocking or pricing in advance.

Selling or pricing in advance is one of the speculative strategies that RBIs adopt. According to the findings, unlike stocking, selling in advance requires PRM tools such as forward or futures contracts, to implement it. Therefore, RBIs who adopt it tend to have long experience in NR trading in order to gain credibility in the event of using forward contracts. Additionally, the use of futures contracts needs some level of knowledge and some collateral (finance) to operate it. Therefore, it is unsurprising that it was found that this strategy tends to be adopted by large RBIs.

Gaining a competitive advantage in the market in terms of better offered prices is one of the key success factors in NR trading. According to the research findings, the negotiation strategy in terms of prices generally occurs in latex trading, since it is a high volume trade. Therefore, slight differences in trading prices can mean high profits. However, price negotiation from a position of market power is also adopted by USS and cup lump RBIs. Using market power or good relationships in trading negotiations has long been established in NR trading, as RBIs have long played a role as a supplier to NR processors. Moreover, the negotiation is not limited only to trading prices, but is common in other aspects of NR trading, such as grading or NR quality. NR grading is considered as one of the key success trading factors in cup lump products, as the grading system is difficult to be standardised, whereas quality testing is only required in latex trading and can easily be disputed.

According to highly experienced RBIs, they used to enjoy less competition in the market. However, todays' business circumstances have changed; it has become more competitive in the market, and the relationship with their buyers has also changed. Therefore, they sometimes have to rely on market-based management rather than relying solely on relationships. Portfolio management strategy is a PRM strategy that depends on both physical and financial product management and relies mostly on marketing performance to gain an advantage from market movements. The strategy requires a variety of PRM tools and some resources to gain the flexibility needed to adjust to changing business environments. For example, according to the study findings, some RBIs who adopt this strategy need warehouses to stock NR products, as well as the ability to arrange forward contracts and to use futures contracts. Moreover, they may use technical graph analysis to guide their decisions in terms of sourcing, stocking, selling, pricing or hedging. It is important to note that the performance of this strategy depends greatly on RBIs' risk-taking decisions.

These final two strategies: alternative product marketing and adaptability, emerge when the market environment changes. For example, the former strategy tends to be used in latex and latex-processing (Latex-RSS and Latex-USS) businesses, when the relative prices between latex and other processed products, such as RSS and USS, are working in favour of the business. This is because, basically, to process latex into other derivative products involves some degree of operational costs. Therefore, the differences in prices between the two, needs to be enough to cover the costs, so that the latex-processed RBIs can generate profit from their added value activities. On some occasions, when prices are not in their favour (in a period of relatively high latex price to USS or RSS), latex-processed RBIs may decide to sell their output in a latex form (without processing

it) to avoid incurring losses. On the other hand, latex RBIs may consider processing latex into rubber sheets (RSS or USS) when their prices are high relative to latex's, so that the business are still competitive, as both latex and latex-processed products tend to compete for the market share with regard to latex. However, the decision to change in order to participate in the alternative product market seems to be complex as well, particularly for latex-processed RBIs. According to the findings, the latex-processed RBIs not only rely on the differences between latex and its derivative product prices, but price movements as well, due to the fact that both USS and RSS are storable. Therefore, the latex-processed RBIs may take a risk in terms of future prices, although they may suffer losses from current prices.

To deal with longer term market changes than price co-movements between NR products, adaptability strategy has also been found to have been adopted by RBIs. This is unsurprising as, according to the research findings, it is evident that NR markets have been exposed to several disruptive changes in recent years, including prices becoming more volatile and the government's price intervention scheme. Regarding the responses to the price intervention scheme, some RBIs changed their role from that of private merchants to leaders of farmers' groups by gathering the farmer registration documents from their suppliers, so that they can participate in the scheme for buying NR products at above market prices. This is because the majority of NR products originate from small farmers. Therefore, by adapting to the environment, they were allowed to sell to the scheme. Furthermore, to adapt to NR markets that become more integrated to financial markets, some RBIs have attempted to adopt new tools that are used in financial markets such as technical graph analysis and marketing reports.

Regarding the importance of some PRM strategies and some of the factors influencing them that were found in this research, it can be summarised by the researcher's interpretation, based on findings in Section 6.2, as illustrated in Table 8.1, although this research is not seeking to rank them. Regarding the importance of PRM strategies, the RBIs adopted as found in this study, are different in terms of a particular type of RBI. In latex trading, based on the research findings, although latex RBIs need to do back-to-back selling because of the nature of latex products, such products can easily deteriorate, and the key outcome of their trading is the selling price. Price negotiation using the market power of RBIs with their latex processors is vital in terms of their business performance, as they trade in high volumes on a daily basis. On the other hand, in cup lump trading, apart from the offered trading prices, this research found that the grading results also play a role of equivalent importance in terms of their trading outcomes. The grading system by sight in cup lump trading requires RBIs' market power

in the negotiation of such grading results, as this system is regarded as being less reliable relative to those of latex, USS and RSS. As a consequence, grade negotiation is considered as another key success factor with regard to cup lump trading. Regarding the research results in terms of USS trading, it is regarded as the most speculative market since the product is storable, easily graded, and has a range of market channels to trade in. As a result, the portfolio management strategy has been adopted by a majority of USS RBIs. Market power in terms of negotiation in prices is essential in USS trading since RBIs tend to trade (both in cash market or selling in advance) in high volume, but less frequently than those of latex. This is because the grading system in the USS is more reliable than that of cup lump, though it is also graded by sight. Therefore, the performance of USS RBIs trading depends more on price. In terms of Latex-RSS, this research found that RBIs tend to adopt a stocking strategy due to the lack of a PRM tool available in this market. However, they are usually able to sell RSS that they produce through the auction market at premium prices because this RSS tends to meet the grade required in the market. In contrast, according to the findings with regard to Latex-USS RBIs, they enjoy more of a variety of market channels that they can sell to, as well as the availability of a range of PRM tools. As a consequence, as in the USS market, the portfolio management strategy was found to be used by the Latex-USS RBIs. However, they need market power to access forward contracts from their business partners to transfer any price risk they are exposed to, so that they can focus on the value added activities. Moreover, the negotiation in prices in order to gain a competitive advantage in the market is also important in these businesses since they need to compete in buying latex from latex RBIs. In summary, apart from the types of RBI businesses, market power (in NR trading commonly resulting from business size) is regarded as an important factor in the majority of RBIs' trades (apart from Latex-RSS RBIs who are likely to trade in transparent markets) as it could lead to better outcomes in terms of NR trading from a champion trading strategy in a particular types of RBI, i.e. back-to-back selling in latex, negotiation in cup lump, portfolio management in USS and Latex-USS, and stock holding in Latex-RSS (see Table 8.1). This is due to a result of trading in complex business environments involving PRM as well as physical trading.

Table 8.1: The importance of different PRM strategies and some factors influencing their adoption

Types of RBIs	The importance of PRM strategies on particular type of RBIs	The importance of factors influencing the adoption of PRM strategies
Latex	○ Back-to-back Selling ○ Negotiation	○ Types of RBI Business ○ Business Size (Market Power)
Cup lump	○ Negotiation ○ Forward Selling	
USS	○ Portfolio Management ○ Stock Holding	
Latex-RSS	○ Stock Holding ○ Alternative Product Marketing	
Latex-USS	○ Portfolio Management ○ Adaptability	

2) To identify factors influencing risk-taking decisions in terms of NR trading practiced by RBIs

Research objective two is interested in which factors and how these factors influence RBIs' decisions and risk taking when trading NR. To answer these questions, the results of factors influencing RBIs in their decisions in risk taking are presented in section 6.3. The research results in this section were derived from semi-structured interview data using a template analysis. Several issues emerged from the data analysis, which are summarised below.

RBIs' decisions to manage price risk are considered complex as price risks can be translated into risk of loss or opportunity for gain. When price risk is combined with the difficulties in price forecasting, this makes the situation even more complex. Even though RBIs' decisions in buying, selling, stocking, pricing in advance and hedging price risk are mainly based on their expectations of future prices, they also consider supply-side factors. Moreover, occasionally the result of a decision is difficult to assess as the RBI may make another decision according to market prices that can easily change. The findings revealed that factors determining RBIs' decisions regarding price risk-taking depend upon economic, operational, psychological and sociological factors. These factors include: the marketing opportunities from price movements; practices of sourcing and stocking; the use of PRM tools; business environments; decisions made by business

partners; the financial situation of RBIs; performance in previous and current trading; and personal characteristics.

Marketing opportunities consist of the analysis of current market conditions and predictions of expected future price movements. At the heart of each RBI's business is opportunity seeking; their business performance relies mainly on market perceptions in both current and future prices. RBIs understand the current market situation using a range of price information and offered prices. Moreover, decisions in trading also depend heavily on RBIs' perception of price movements, although forecasting future prices is considered complex and dynamic.

The ability in sourcing NR products involves stock being held in warehouses, future sourcing depending on speculation about seasons and weather and past sourcing examined from volume trading history. One of the main functions of RBIs is to source NR products. Therefore, their business depends highly on their sourcing ability. Many tend to stock NR at a satisfactory level before selling the rest. This level is linked to their available capital. RBIs also tend not to sell their stock if they have experienced difficulties in past sourcing or they expect low future supply.

Stocking ability depends on the size of business capital and the warehouse. RBIs who wish to take risks by stocking need enough capital and/or proper warehouses. It is worth nothing when they can speculatively stock but do not own their own warehouse, even if their business partners allow them to sell on consignment.

Hedging ability means accessibility to available PRM instruments. RBIs (mostly small or novices) who are unable to use PRM tools to manage their business are ultimately forced to take price risks. In contrast, RBIs who have access to PRM tools can decide whether or not to take the risks.

The business environment in terms of competition in the local market is also considered by RBIs when making decisions about risk. The areas that have low competition give RBIs the margins needed to make a profit. As a result they tend to be risk averse, engaging in back-to-back selling. On the other hand, in high competition markets, RBIs are sometimes forced to take risks to generate profits.

Regarding an intermediary role in the NR supply chain, business partners' decisions (suppliers and buyers) also play a vital role in the trading decisions of RBIs. As the nature of business of RBIs is to integrate the financial market in pricing and the physical

market in sourcing, their business performance is likely to rely on buyers' decisions when marketing their processed products and farmers' decisions when selling their produce.

The financial situation of RBIs—mainly the business owners—includes debt, loans and alternative sources of income. Both debt and, surprisingly, loans, become the factors that force RBIs to take risks. For example, RBIs that are in debt are likely to take higher risks in order to gain enough profits for repayment or so that they can be compensated with the interest rate. RBIs who are debtors of their suppliers they need to keep operating their business, so that they can stay in contact with their borrowers; otherwise, they may lose the loan. In contrast, an alternative income allows RBIs to avoid taking risks as they earn enough to live.

The business performance factor is composed of the results of previous decisions and gains and losses from physical holdings and from market positions. RBIs admit that they are likely to be cautious in their next trading experience after they have made a previous poor decision while they tend to take more risk if their previous decision was successful. Additionally, they are inclined to avoid selling NR stocks if they will make losses but they admit that they can accept such losses and cut it if the losses occur in financial market positions.

A personal profile includes a decision-maker's age, trading experience and attitude towards price movements, which all impact on an individual's price risk-taking decisions. The age of an RBI influences the degree of risk they will take; the younger the RBI, the more likely they are to take higher risks. However, the key success of business appears to be trading experience, though this is less helpful when the market structure changes. Some RBIs who concern that if they employ forward selling, it may result in further price falls tend to be exposed to price risks when prices decrease, since they hold their stock without hedging.

3) **To investigate how RBIs select market channels to sell their NR products, as well as factors influencing this selection**

Research objective three examines how RBIs choose market channels for their business and the factors that influence these choices. The research findings in relation to market channels (in section 6.5.2) and market channel selection (in section 6.4) address this research objective. The findings are derived from the similar data source (interview transcripts) and analysis method used to address research objective two.

There were five market channels for trading NR found in this research: trading in auction markets; trading directly with processors; trading via RBIs; trading via government organisations; and trading in futures markets. The direct market to processors is the main market channel and auction markets play a crucial role in providing price benchmarks in trading. Trading amongst RBIs is not uncommon as this has obvious benefits, such as logistics costs and market power, especially when using large-size RBIs—for example, in latex supply chains. However, some NR products can be used as price speculative products, such as USS. Therefore, trading between similar-sized RBIs or even selling large amounts to smaller RBIs is also possible since it depends on the prices offered. Government organisations such as ORRAF also play a crucial role as market channels for selling NR products, particularly during price intervention schemes. Finally, as Thailand has a domestic commodity futures exchange (AFET) in which NR is traded, the futures market is also able to use a market channel.

One of the crucial findings in this research is that to select market channels to sell their products, RBIs make their decisions based on both hard factors (e.g. attempts to maximise their trading profits) and soft factors (e.g. attempts to support their business activities). According to figure 7.6, the hard factors include the trade-off between costs (operational costs) and ultimate benefits (offered prices, grading system and scale reliability) while soft factors comprise of payment reliability, convenience in trading (including relationship and location distance) and PRM tool provision.

4) **To develop a conceptual model in order to understand the complexity of price risk in an RBI context, and their management in terms of PRM strategies, decision-making in terms of risk-taking and market channel selection**

To address this objective, this study proposed a conceptual model of understanding PRM practice in the context of RBIs' businesses (see Figure 7.1). This represents the key contribution to both knowledge and professional practice resulting from the study. The model comprises four main components of price risk: PRM strategies; risk-taking decisions; market channel selection; and price risk based on seven perspectives. These perspectives are: PRM tools; available market channels; price information; pricing methods; price forecasting methods; future market use; and ICT use. As the details of the first three components of the model were outlined in order to address research objectives one, two and three earlier in this section, below are the details of the seven facets of price risk environments.

Regarding the RBI business environment, the various products carry low margins because they have a market where competition is intense and where prices are highly transparent along NR supply chain players, including farmers. However, the RBIs mostly trade in high volumes, and therefore is able generate enough revenue to sustain the business. RBI business is also considered to be a cash market since the trading payment method is mainly the exchange of NR product with cash, even though some pay in credit but usually repay the debt no more than a day after.

In term of price behaviours in the markets, it seems to have been significant more volatile in recent years and there has been downtrend since the price bubble burst in early 2011 after a period of dramatic increase. After the long period of price increase since 2002 (it was interrupted by price collapses on some occasions, especially in 2008), the market has become highly competitive in terms of RBI business, perhaps because some RBIs expected price improvement in the future. As a result, RBIs are exposed to high price risks as there is a lack of effective PRM tools, although some large-sized RBIs have more ability to access them when they are provided by processors.

During the periods of price volatility, there seems to be asymmetric price transmission between local and global markets. During periods of price decreases the price drops immediately with the similar amplitude of the world market. In contrast, its increase seems to be slow both in terms of levels and time. This may distort the ability of price interpretation from the world market.

In terms of the context within RBI business, there are five types of market structures regarding products and trading activities: latex, USS, cup lump, Late-RSS and Latex-USS. Latex RBIs are the most integrated in their particular supply chains. Although the price risk that they are exposed to is relatively low as they trade on a daily basis, their business margin is also relatively low as they have to compete for latex that is also used in other latex processor supply chains, such as processing latex into unsmoked or smoked sheet rubber. Therefore, they rely mostly on relationship management to maintain their market power in price negotiations.

In contrast, the USS product is considered to be a speculative NR product as its properties in reselling, price transparency, and transmission between the markets are high. However, it also makes the market more competitive. As a result, it is unsurprising that some RBI businesses rely on speculation, resulting from a low profit margin setting.

The cup lump market is considered to be between the USS and latex markets in terms of the integration of market structures. However, unlike latex product, which is traded daily,

the cup lump product is usually taken some time in drying after being collected. Furthermore, the grading mechanism is less transparent than that used for USS. Therefore, RBIs need market power to negotiate in it, meaning the market relationship is important.

It could be therefore argued that the RBIs who need PRM tools the most are Latex-RSS and Latex-USS. This is because the lag time of latex procurement and its finished product ready to be sold are approximately four and ten days, respectively. Considering price fluctuations, the profit margin of businesses from the nature of value-added business are difficult to maintain without the proper PRM tools. However, it is surprising that there is a lack of effective tools for them, especially for Latex-RSS. Therefore, they are mainly forced to be a price risk taker as they have to hold their stocks, waiting for them to be sold. Nevertheless, there are more market channels and PRM tools available for USS than for RSS products. With this reason, some RBIs choose to produce USS rather than RSS, even though the former's process takes longer.

This research found little availability of effective PRM tools, although PRM instruments play a vital role in PRM strategies adopted by RBIs. They mainly rely on forward contracts provided informally by processors; otherwise they have to depend on cash markets. Moreover, there is a futures market in Thailand, but as it is inefficient for price hedging, RBIs rarely use it for hedging purposes. Instead, some of them use it for speculation. Even though it is the availability of selling in a consignment contract provided by some processors, it is considered to be a speculative rather than a price-hedging tool. Recently, there was the introduction of a forward contract for RSS arranged by some auction markets. Although it is only the beginning stage of forward contract introduction, with limitations in trading volume and delivery times, there is the potential for the extension of their flexibility in the future.

Regarding price information, Thailand's NR market has high price information transparency, mainly due to the existence of auction markets, futures market (domestic market, AFET, and international markets, TOCOM, SHFE and SICOM) and affordable and accessible technology, such as mobile phones, smartphones, tablets, PCs and laptops. In terms of local markets' trading prices, price information transmission is almost immediate from world markets, even though it is considered to be asymmetric.

Considering the pricing methods used by RBIs, their business operates with low margins using a price reduction method from the price benchmark to maintain business competitiveness. The nature of RBI business depends upon immediate price forecasting methods; however, there are no such quantitative methods that meet required

performance standards it is a low margin business and a highly competitive market. As a result, their price forecasting methods are mainly qualitative methods particularly in consulting with their business partners, processors or large RBIs, or holding discussions within their RBI networks.

Regarding the use of futures markets, RBIs depend principally on international futures markets, as the domestic market has relatively low liquidity in trading. The function of using futures markets is predominantly for price information in trading activities, such as identifying benchmark prices for setting buying prices and negotiating selling prices, and as a price forecasting indicator for decisions regarding risk. It is interesting to note that although some RBIs participate in futures markets: rather than use them for price risk transferring, they prefer to use them for price speculations. This is unsurprising as the ability to price risk hedge in futures market is low. This is mainly due to the illiquidity in the domestic futures market, AFET, and the inaccessibility of global futures markets. Some RBIs are able to participate the global futures markets although it is not fully legal. However, there are no brokers in Thailand. Therefore, they use the services in black markets, which could be fraudulent. Moreover, they have to be exposed to the consequences of risks, such as basis risk and currency exchange rate risk. Another function of the futures markets that seem to have been never used by RBIs is the delivery alongside futures contracts. This may be because of the inconsistency of NR trading grade and volume relative to what they own, and the inconvenience of the place of delivery.

Technology plays a crucial role in price information, resulting in a change of bargaining power of NR supply chain actors. As mobile phone technology becomes more accessible, there is an increase in seller power, which in turn leads to the market becoming more competitive. When the competitiveness of the NR market combines with the high volatility of market prices, PRM used by RBIs is considered ineffective as there is a shortage of effective PRM instruments.

8.3 Contributions of the Research and Its Implications

The review of the literature in relation to PRM practices revealed that there is a current lack of PRM in the context of RBIs. As indicated, the main contribution of this research to existing knowledge is the emerging integral conceptual model of understanding the PRM practices of a commodity that is traded in high volumes and with a low margin, in the context of a developing country. The model integrates various issues in relation to price risk and its management as a means of enhancing the understanding of PRM practices

in the NR market in the south of Thailand (see Figure 7.1). Consequently, this conceptual model is considered unique as it has inductively emerged from the context of the rubber intermediary business. However, the conceptual model may be transferred to other supply chain players in the NR industry, such as large NR farmers or small NR processors. Moreover, other agricultural commodities that have similar supply chain characteristics as those of the NR industry, may take inspiration from this model. As a result, the present study makes several noteworthy contributions to PRM in the NR industry. There are six other potential contributions to knowledge derived from this study (four of them are the individual components of the integral conceptual model).

First, from the existing literature, selecting management strategies is considered a complex process (Tomek and Peterson, 2001). Consequently, the findings have generated a greater evidential base in terms of PRM strategy research. The findings of this thesis could be used to shed light on the understanding of PRM strategies adopted by RBIs, and the factors influencing its formation in the context of the NR market in the south of Thailand (see Section 7.2). Apart from the contribution to the academic literature, the findings have made a contribution to the work of professional traders such as RBIs and processors, as well as to that of other NR market stakeholders such as farmers and policymakers.

Second, the current findings add to a growing body of literature on decision making in risk taking. This research contributes to the existing literature in relation to risk-taking decision by enhancing the understanding of such decisions in the context of RBIs, who trade NR in high volume at low margins. The research found that a risk-taking decision is considered to be a complex process that involves a variety of factors including operational, economic, physiological and sociological factors (see Section 7.3). A commodity trading decision in practice is highly complex as it involves many decisions including risk-taking decisions. This results in difficulties in searching for relevant information and evaluating every decision due to human cognitive limitations (Pennings, Isengildina-Massa et al., 2008). Consequently, risk-taking decisions are an important component in commodity trading. The findings from this research thus may add to the current literature in relation to risk-taking decisions in commodity trading.

Third, the findings in this primary study provide a new understanding of market channels and their selection by RBIs in an emerging economy (see Section 7.4). According to the existing literature, the selection of market channel has become one of the important factors for determining trading performance (Yunus and Syahputra, 2013). As a result, the conceptual model of such market selection may enrich the understanding of the

complexity involved in choosing such market channels to sell commodity products, which may, in turn, help market participants improve their marketing performance.

Fourth, this research provides a framework for the exploration of PRM environments based on seven perspectives (see Section 7.5). In the existing literature, the environment of business tasks is one of the main factors influencing small business management (d'Amboise and Muldowney, 1988). Therefore, the analytical framework proposed in this research may be used to gain an understanding of the price risk in a particular commodity business circumstance for commodity supply chain stakeholders.

Fifth, the existing literature has mainly studied PRM strategies, decisions in price risk taking, and market channel selection separately. However, the findings in this research improve our understanding of the connection between PRM strategy formation and implementation in the context of RBIs (see Section 7.6). The research findings identified a strategy that is implicitly formed based on types of NR businesses, the availability of PRM tools, the size of the business (market power), resources, RBIs' knowledge and experience, competition in the market (location). Moreover, there is a weak link between the PRM strategy employed and the implementation stages of risk-taking decisions and market channel selection.

Sixth, the results of this research have created a provision to serve as a base (the theoretical framework) for further studies in the area of PRM in the context of NR supply chains. This includes the assessment of PRM strategies' performance, how NR traders should select the strategy regarding particular price risk environments, how they should make risk-taking decisions in trading to enhance their trading profits, how they should choose market channels and PRM tools in their NR trading to obtain better profits. Moreover, as a consequence of the findings of this research, more specific empirical research is required to be conducted in order to enhance the understanding of NR markets stakeholders. In so doing, it may result in better informed decisions such as those related to the price transmission between markets and NR products, futures markets' efficiency and price forecasting methods' performance for particular NR market players.

The implications of this research relate to the understanding of price risks and PRM in NR industries, which is one of the major agricultural industries of Thailand (Weerathamrongsak and Wongsurawat, 2013). New or current RBIs, NR market participants, and policymakers could take benefit from the study.

RBIs

It is obvious that the main benefits of this research go to RBIs who are the central focus of the study. Understanding their own practices in-depth and comparing them to others is directly beneficial for them to identify where they are and where they may be heading. The latter may be achieved through the adaptation of the proposed conceptual models to support or realign their business profile, in particular through changes in addition to the knowledge and access to a variety of resources. Additionally, the research reveals a range of PRM strategies and main factors that influence their decisions not only for the existing (both experienced and novice) RBIs but also those who intend to participate in the NR industry as an RBI.

Apart from the internal improvement of the RBI business, the findings of this report may lead to indirect benefits to RBIs from other stakeholders in the NR industry who would like to support them, such as their business partners or the government. Understanding their situation may result in changing in policy or provision to support them. Therefore, it may improve the factors of business environments, such as more accessible effective PRM instruments so that their business becomes more manageable.

NR market participants

Whereas co-operation in the supply chain is considered to be one of the key success factors in modern business, the understanding of RBIs' role and their practices by their business partners: farmers and processors may see an increase in opportunity due to the co-operation. This research reveals the RBIs' PRM practices have been very much *"a black box".* As a consequence, their business partners, both suppliers and buyers, may adapt their practices to reduce the conflict of interest between them, which seems to undermine the competitiveness of the whole supply chain. Therefore, the research is the first footsteps to future co-operation of RBIs with other market participants.

Policymakers

The results of this research may raise the awareness of policymakers to pay more attention to RBIs as the role they play in the NR supply chain is indispensable. This may result in the formation of policy that is friendlier to RBI businesses as the previous (buying directly from farmers) seemed to undermine RBIs' role and was a less effective way in terms of market price improvements. Therefore, an RBI-friendly policy is likely to sustain the NR supply chain in the long run.

8.4 Recommendations to the NR Industry

The need for better PRM instruments in the NR industry

As the research findings suggested, the Thai NR industry requires higher efficiency of existing PRM tools, such as futures contracts, as well as accommodately new and alternative PRM tools, such as formal forward contracts and options contracts. One of the ways to make the futures markets more efficient is to increase knowledge of hedging and futures market use. Therefore, the relevant organisations to this issue, such as AFET, should arrange the training sessions that meet the target NR supply chain players' requirements in terms of a place and time that suit them, and the number of sessions required as it involves millions of farmers and thousands of RBIs. Moreover, it needs to provide smaller sizes of futures contracts in order to meet the size of a number of businesses in the sector.

Correct and timely NR market information needed

It can be seen that there is a need for more access to transparent information relevant to the NR industry, such as supply, demand and its stocks so that the supply chain can be more resistant to price collapse from a range of external pressures such as goes beyond panic. Sometimes, insight information or rumours may easily lead to a faulty price signal to the market as market participants are unable to assess it. Therefore, the availability of reliable information will help businesses to check the real situation. Effective management requires informed decisions resulting from correct and timely information. Therefore, one way to sustain the NR industry and make the NR supply chain efficient is to make all supply chain stakeholders access to the information equally.

The need of support for RBIs from policymakers

The importance of RBIs' role in the more modern free market has been ignored from the policymakers as the understanding that they, perhaps only some of them, took advantages from farmers. There was evidence from the interventionist market policy in Thailand's NR market (Weerathamrongsak and Wongsurawat, 2013). It could be harmful to the RBIs by eliminating or undermining their role from the supply chain. As a consequence, this tends to distort the market efficiency in the long run. Therefore, policymakers instead should support the RBIs with proper market-based PRM. This includes providing effective PRM tools and the required knowledge to them so that they can play their role to make the NR supply chain more efficient, as they are expected to do.

The need of support for RBIs from processors

The majority of support that RBIs receive is from processors, their main business partners. However, the increase of complexity of business according to price volatility tends to force the processor to secure their supplies. One of the strategies for dealing with this problem is to back integrate by gaining their own NR plantation (Sri Trang Agro-Industry Public Company Limited, 2015). However, eliminating RBIs from their supply chain, it may be inappropriate to Thailand's NR industry as more than 95 per cent of NR producers are smallholders, unlike other main NR producing countries where estate NR producers also play an important role (Burger and Smit, 1997). As a consequence, using RBIs as a tool to integrate the supply chain to make it efficient is a practical choice. Therefore, the processors should provide them with proper PRM tools and co-operate with them.

8.5 Limitations of this Research

Some limitations of this research need to be considered. Firstly, the scope of this study was limited in terms of the generalisability of its findings. Even though this research was carried out with research participants from broad locations in southern Thailand and a range of NR products that they trade, this research does not seek to generalise the findings due to the nature of the sampling method used and the qualitative research approach adopted. Snowball sampling was used in order to recruit the participants to gain rich data regarding RBI practices of business management in terms of PRM, which is considered to be a business secret. The introduction from a person they already know allows the researcher, who is an outsider, overcomes the problem of asking overtly sensitive questions. This technique is one of the key successes contributing to this research. Using the criteria of RBIs who may take an active role in managing price risks helped the researcher gain insightful information relevant to the research topic.

Secondly, the results may not be applicable to NR industries beyond the south of Thailand or in other equivalent industries. As the different markets in NR industries or other similar industries may vary in context such as in terms of market structures, supply chain participants may practice differently in PRM. Therefore, further research in particular contexts is needed so that the research results can be compared and contrasted to those of this research. As a consequence of such a development, an enhancement of the understanding of PRM practices in wider contexts could be achieved.

Thirdly, another issue is the completeness of data due to sensitivity issues. The researcher is considered to be an outsider and did not know the research participants beforehand, although some measures were applied to overcome this by using snowball sampling and contacting them a few times before conducting the interviews to recruit research participants, explain the project, send the relevant documents and arrange the time to do the interview. As a result, some sensitive questions, such as questions relevant to corruption, were sometimes avoided being answered by some research participants. Although the researcher explained that this research was conducted under the university's ethical regulations of anonymity and confidentiality, some of them were not familiar with this as, perhaps, for some of them this research is the first that they have participated to. However, some research participants gave information openly that allowed this research to obtain more comprehensive data.

Finally, there was a problem due to the language used by RBIs. Although the researcher is a local who was born and grew up in the region and is able to use the southern Thai language, as the research participants are spread out in the south of Thailand they sometimes used terms relevant to trading NR differently. This might lead to ambiguity in analysing and interpreting the interviews. However, the researcher considered carefully the context surrounding the potential ambiguous terms during the data analysis and interpretation.

8.6 Recommendations for Further Research

There is potential to conduct further research in several areas. Firstly, PRM practiced by exporters is another frontier to be investigated as they seem to be more cutting edge in terms of available PRM instruments, PRM strategies, knowledge and resources than RBIs. It can be clearly seen that there is a need for effective PRM for other NR supply chain players in the Thai domestic market, such as efficient futures or options contracts. Therefore, understanding exporters' PRM practices may allow other NR participants to learn from them and apply them to their contexts. Moreover, it may be the starting point of co-operation between all Thai NR stakeholders by aligning their practices in order to match with those of exporters who are considered to be the gatekeeper of international NR trading. As a consequence, it would be contended that the benefits of the co-operation will help the whole Thailand NR industry.

Secondly, NR price forecasting modelling is also challenging for NR researchers and practitioners. However, there are limitations of this kind of research in terms of a variety of time horizons in studies. Individual NR stakeholders may need different time horizons

in their price forecast. For example, immediate-term traders such as RBIs may rely more on price momentum than long term prices from econometric models, whereas policymakers may require the latter rather than the former. Therefore, research on the relationships of price behaviours in a particular time horizon and implications of the particular stakeholder will help price modelling researchers to focus on more comprehensive ranges of time horizons, which in turn will contribute to all NR supply chain participants.

Thirdly, in order to sustain the NR industry, apart from co-operation and understanding prices behaviours required in a particular context of each NR supply chain player, proper decision support systems for them are also needed to make their management more effective. It is widely accepted that in the past few years there were periods of high price volatility of levels that they have never seen before. As a result, the majority of their efforts were put into managing price risks in order to survive. Therefore, less effort may be left to develop other aspects of management to make their business management more efficient, such as reducing transport costs or improving production processes. All in all, research on required decision support systems for RBIs and other NR supply chain participant will help them in making more timely and effective decisions.

Finally, one of the factors that may explain NR price formation is the role of NR supply chain players in price movements. Understanding their market power on prices may lead to measures to balance the market power amongst NR supply chain players, which in turn will lead to greater stability of the NR market. Therefore, market price movement analysis based on supply chain roles of market participants could be a crucial area for future research.

8.7 The Reflective Researcher

The details of this reflective research process are available in Appendix V.

Appendix A: Physical Markets of Natural Rubber in Thailand

There are two main types of market channels in trading NR products in the south: central or direct markets. Most of them are privately traded between NR buyers and sellers, even though trading via the central markets generally achieves higher prices. The details of the market are as follows.

- **Central Markets**

By receiving support from the government, NR auction or central markets provide a marketing service to NR trading participants and provide price information, which is usually used as a price benchmark; this leads to the enhancement of farmers' bargaining power. There are three main central NR markets in the south. The oldest one is the Hat Yai central market in Songkhla province. The other two are the Surat Thani and Nakhon Si Thammarat central markets, located in their eponymous provinces.

The emergence of the auction market had the effect of providing a fair trading service to NR supply chain participants and making the NR market more transparent. It is believed that the market enhances the bargaining power of small farmers because it provides marketing channels and price information. Initially, the government introduced the central markets to support the NR marketing activities of the stakeholders.

Recently, the establishment of new private auction markets has benefited NR supply chain players with alternative or complementary choices from the government. Private auction markets also play an important role in the southern NR supply chains. They provide an alternative choice of marketing channel to the former due to their different locations.

- **Direct Markets**

Although the auction market plays a crucial role in NR trading, most of the NR products are traded in private markets. This may be because not all NR products can be traded in auction markets, such as cup lump. Even with regard to the NR product being traded in the auction markets, there is a limit in capacity within that market, which could be one of the reasons for direct trading. Furthermore, transportation is also important, as it is the one of the main costs in NR trading. A closer market may lead to a lower cost in business operation. Therefore, selling NR products directly to NR processors is popular in the south.

Appendix B: The Futures Exchange Market of Natural Rubber

Three main futures exchange markets physically trade prices of NR in Thailand influenced by, these are the Tokyo Commodity Exchange (TOCOM), Singapore Commodity Exchange (SICOM) and Shanghai Futures Exchange (SHFE) (Boonyanuphong and Sriboonchitta, 2014). TOCOM is the oldest rubber exchange market. The prices in this market are usually used as a benchmark price in NR trading both at international and domestic levels. SICOM is the market trading the physical products. The market is located in the area that was the NR hub in the past. However, it is still considered important in NR physical trading, even though the trading volume has declined in recent years. SHFE is currently the most active trading market in terms of daily volume. As China is the biggest NR consumer, the SHFE has become of increasing importance in recent years.

Apart from the three foreign exchange markets mentioned above, the Agricultural Futures Exchange of Thailand (AFET) was first introduced in Thailand in 2004. The purposes of the market are to support the stakeholders in NR supply chains in fair trading and managing price risks. Moreover, it provides price information to the NR industry's participants (Agricultural Futures Exchange of Thailand, 2013).

Like several commodity futures exchange markets in emerging countries, the AFET has traded in low volumes. This results in the problem of effectiveness with regard to its role as a PRM instrument. Illiquidity gives hedgers difficulty in buying and selling the contracts that are consistent with those in physical markets. Moreover, the reliability of its function as a price benchmark of the whole market is still questioned, because its low trading volume may provide some traders with the opportunity of manipulating the market.

Appendix C: Thai Natural Rubber Market Liberalisation

Even though the Thai NR market is considered a free market, on some occasions the government has decided to intervene in the market. This is because the main NR producers are small farmers who are considered to have less power in the market and less bargaining ability in the supply chain.

- **Government Intervention**

The government occasionally intervenes in the NR market by stockpiling NR products, especially when prices show a downward trend (Delarue and Chambon, 2012). A declining price trend has taken place during the past three years (2011-2014) (Nobnorb and Fongsuwan, 2015). Before the period of market intervention NR price movements were considered to have high volatility. This led to a series of farmers' protests. Additionally, NR is considered as 'a political crop' as it is relevant to millions of farmers who are voters. However, the result of government intervention is still debated**.** In addition, the International Rubber Consortium (IRCo) was formed in 2002 from the three biggest NR producing countries at the time: Thailand, Indonesia and Malaysia (International Rubber Consortium, 2015), after the termination of the International NR Agreement in 1995. The main objective of the IRCo was to stabilise the price of NR products.

- **Market Integration**

NR plays a vital role as the main raw material in several modern industries, as mentioned in 1.3.1. Therefore, it is undoubted that integration of the supply chain, in order to secure the source of a raw material, is a management technique, especially during a period of commodity price volatility. Some tyre companies set up subsidiary companies to source and primarily process NR to supply the parent company (Weerathamrongsak and Wongsurawat, 2013). Some NR processors conducted a strategic plan to plant their own NR plantations and gain a competitive advantage in the global market. The salient example of this is the Sri Trang Agro-Industry Public Company Limited, which has been implementing a 50,000 rai (8,000 hectare) NR plantation in Thailand (Sri Trang Agro-Industry Public Company Limited, 2015). Moreover, some processors take an advantage of the plentiful supply of the raw material in adding value to their businesses by producing a simple end product, such as gloves from concentrated latex. Therefore, the effort to integrate from downstream to midstream to upstream of the NR supply chain players is common.

However, due to the nature of small farming in Thailand, the integration of the chain is not an easy task. It tends to be difficult to buy or rent a large area of land to run as an estate. Additionally, NR production is a labour-intensive process, resulting in the need for cheap labour in order to gain an advantage in business. As a result, Thailand’s neighbours such as Myanmar, Cambodia and the Lao People's Democratic Republic, are a better choice in terms of NR integration of supply chains since they have more unused land.

Appendix D: Commodity Price Risks and Its Implications

1. Introduction

Prior to understand management of price risk, it is necessary to understand price risk in commodity supply chains. As stated in the introductory chapter, the aim of this research is to reveal PRM as practiced by RBIs taking into account price volatility. This Appendix reviews the literature in relation to commodity price risk, and the implications of price risk on commodity stakeholders. Section 2 is a review of the literature relevant to commodity price risk. The next section, Section 3, is the literature review with regard to commodity price risk implications. Finally, a summary is provided in Section 4.

2. Commodity Price Risk

The volatility of commodity prices has been an important phenomenon in last few years. It is clear that this incident has been attracted attention by many stakeholders in commodity communities, such as researchers, practitioners and policymakers. There are several essential examples, ranking from adding the excessive volatility of commodity price issue to a series of the G20 meeting agendas in 2009, 2010 and 2011 (Devlin, Woods and Coates, 2011), and to investigating the potential origins of the phenomenon from the supply and demand aspect (Roache, 2012) and the speculative behaviour aspect (Irwin, Sanders and Merrin, 2009; Korniotis, 2009). This session summarises the basic understanding of the commodity price volatility in some point of views: its sources, implications and possible solutions.

The Sources of Commodity Price Volatility

Many researchers have investigated the causes of the commodity price fluctuation in recent periods. On one hand, a traditional demand and supply shock factor, especially demand from emerging markets, has played a crucial role in describing commodity price movements for decades. On the other hand, investors' speculation in future exchange markets gives some evidence that it may be a potential source of the excessive fluctuation of commodity prices in recent years. The followings are some latest research relating to these topics.

1) Demand and Supply Shocks

Yu (2011) studied relationships between mining commodity demands from China and the world mining commodity prices. Using graphical representation from historical data of the

dramatic growth in China's commodity demands and prices, the author concludes that the boost in China's demand for metals and minerals to support urbanisation and industrialisation influences on the prices. Additionally, the author suggests that apart from the demand expansion, other price-driving factors such as economic circumstances, inventory levels, complex financial instruments and political situations, should add to a commodity price formation framework so that price formation process can be explained more clearly.

Roache (2012) studied the impact of a variety of commodity demands in China on their prices. This study used Vector Autoregressions (VARs) approach and monthly assessments of demand, supply and prices of oil and some major metals, namely aluminium, copper, lead, nickel, tin and zinc, data from 2000 to September 2009. The results show that only the demand shock of oil and copper in China have an significant effect on the international prices. On the other hand, those of the rest commodities have less impact on their prices. In addition, this research suggests that China's commodity demands have smaller impact on world commodity market than those of the United States, but they have significantly increased in recent years.

2) Speculative Behaviours

> *"Financialization is a term that describes an economic system or process that attempts to reduce all value that is exchanged (whether tangible, into a financial instrument or a derivative of a financial instrument." (Ghosh, 2013, p. 32)*

During the recent periods of commodity price fluctuation, in addition to the fact that there are the increase in demands in emerging markets, tight supply from weather conditions and the uses of some food commodities for alternative energy production, it coincides with a phenomenon of greater participation of financial investors in commodity markets, namely *'financialisation of commodity markets' (Gilbert, 2008; Masters and White, 2008; Mayer, 2009; Silvennoinen and Thorp, 2009; Tang and Xiong, 2010; Bicchetti and Maystre, 2012)*. It is suspected to be one of the major sources, if not the main source, to drive commodity price higher and result in more volatility by many researchers, policymakers and even some investors. A number of researchers have conducted research to examine the relationship between commodity price fluctuation and speculation in commodity exchange markets in recent years. However, there is no consensus on the results from the studies.

- **Speculative behaviours have positive effects on commodity markets**

Irwin *et al.* (2009) advocate that the introduction of the commodity derivative markets does not result in the more increasing volatility of commodity prices in physical markets. In contrast, it is likely to make the prices of cash markets more stable when compared with other commodities which do not trade in the future markets. This research suggested that the origin of the volatility of commodity prices bases on supply-demand factors, especially the low level of many commodity inventories.

Moreover, the similar result with that of Irwin *et al.* is found in the study in metal markets (Korniotis, 2009). Several industrial metals with and without trading in the future exchange markets are investigated with regard to the co-movement amongst their prices. The result shows that co-movement amongst them exists. Therefore, there is no a significant effect from speculative behaviours on physical metal prices. Additionally, there is no correlation between the industrial metal prices and the total return of the S&P Goldman-Sachs Commodity Index (Korniotis, 2009). On the other hand, they have the positive relationships with the world per capita GDP growth which represents the increase of demands (Korniotis, 2009).

Basu and Gavin (2010) reported that the surge in trading of commodity derivatives during the last decade comes from two reasons. The first one is because of large scale investment institutions searching for higher yields investment during the low interest rate period. Another reason is the hedging risks of holding equities as evident from some research suggested that commodity prices have negative correlation with equity prices. Nevertheless, from their empirical findings, the correlation varies both negatively and positively over the different periods.

- **Speculative behaviours have negative effects on commodity markets**

There is further research leads to the conclusion that speculation in the future derivative markets is a significant factor to the more volatility of commodity prices, even though there are clear evident in the growth in demands, inelastic short-term supplies and low levels of inventories in some commodities. However, these factors cannot explain fully the greater frequency and higher amplitude of price volatility.

Master and White (2008) demonstrated how commodity index investors affect food and energy prices. As speculative position limits regulations in the commodity future markets were compromised, commodity index investment has incredibly raised from just 13 billion dollars in 2003 to 317 billion dollars in 2008 (approximately 24 folds). In this period,

commodity prices have also increased by more than 200 per cent on average. Because commodity index managers' trading strategies are long only, passive investing strategy, regardless of the prices and demand and supply conditions, the authors believed that they are the main origins of the commodity price rise in the period. Commodity indices have been invested, since they were supposed to have no or negative relationship with others assets. In addition, investors are searching for higher yield investment choices during low interest rate eras. As a result, index investors dominate others participants in future markets making the prices are sometimes far away from fundamentals, which lead to bringing to a halt price discovery and hedging functions for commercial traders. In addition, the authors also proposed to restore the position limit measures in non-commercial traders participating in commodity derivative markets around the world.

Gilbert (2008) suggested that the introduction of the third participants in commodity exchange markets, the commodity index investors, apart from hedgers and speculators play a vital role in an increase of commodity prices. With substantial amount of money they manage, the commodity prices may be amplified the levels or even the directions changed away from those of physical markets. The author stated that, with the reason mentioned above, the commodity prices sometimes do not reflect the supply-demand fundamentals. Using Granger non-causality tests with corn, soybean, soybean oil and wheat prices traded on the Chicago Board of Trade (CBOT), there is only one rejection of the tests in case of soybean. However, the author concluded that there is some weak evidence that index-based investment has driven the commodity price boom in recent years, but it may happen particularly on some commodities and periods of time.

Mayer (2009) investigated the impact of two different investors in commodity future markets: commodity speculators and index investor, on commodity price formation. Using Granger causality tests, index investors are prone to influence prices of almost all commodities throughout the markets, while speculators tend to impact only agricultural commodity prices. In addition, there is some evidence show that an interdependent between financial and commodity market has increased during the studied period resulting from investors who are likely to choose a particular commodity as an asset from its return rather for a diversified portfolio reason as they did before. In the meantime, the role of dollar depreciation hedger has decreased in the same period. The changes of the character of future exchange markets result in the difficulties for commercial traders to hedge their prices risk as it become a more complex and expensive activity. Moreover, commodity prices in the future exchange may be an unreliable benchmark for physical trading because of the increasing volatility.

Silvennoinen and Thorp (2009) studied the relationship between commodity future and financial markets. This study uses DSTCC-GARCH models with monthly data from future and physical markets of 24 commodities between May 1990 and July 2009. The results show that the commodity futures has dynamic correlation with stocks changing from no relationship at all in 1990 to a positive relationship in 2009 between them. Additionally, from empirical evidence, greater commodity returns can be expected during the periods of low interest rate, low corporate bond spread, US dollar depreciation, high stock price volatility and high open interest in stock markets.

Tang and Xiong (2010) studied the correlation between commodity index investment and commodity future markets. The authors stated that not only does the formation of non-energy commodity prices rely on simply supply-demand fundamentals, but it depends on complex speculative behaviours of financial investors as well. This phenomenon emerges several new issues for commodity markets' participants such as producers for hedging strategies, investors for trading strategies and, especially, governments for energy and food policy. To calm the severe impact from commodity prices spill over the future exchange markets, the authors suggested that tight regulation for position limits of index investment should be applied.

Buyuksahin and Robe (2014) investigated the cross-market linkages between US stock and commodity exchange markets, and whether they are influenced by the different types of traders such as hedge funds and index funds. Using trader positions in both markets from the US Commodity Futures Trading Commission from 1991 to 2010, the daily return co-movement between equity and commodity indices are analysed by a dynamic conditional correlation analysis method. The results show that there is the linkage between the two markets and its level is fluctuated throughout the periods. However, it seems increasing in the recent years, especially when hedge fund participate in both markets.

Bicchetti and Maystre (2012) investigated the co-movement of intraday returns between commodity and equity markets. High frequency data: within one second, ten seconds, five minutes and one hour, of the E-mini S&P 500 index, light crude oil WTI, corn, wheat, sugar, soybeans, and live cattle prices from the new Thomson Reuters Tick History (TRTH) database between 1997 and 2011 has been analysed by using a correlation analysis method. The results show that the correlation structure between the returns of two markets has changed since September 2008 from almost zero to strong positive relationships in 2011. Moreover, the authors mentioned that this may be the

consequences of high frequency and complex algorithm trading strategies developed in recent years.

- **Speculative behaviours have both positive and negative effects on commodity markets**

Some researchers have an intermediate view of speculative behaviours on the commodity prices: mixing both positive and negative sides. Doroudian and Vercammen (2012) show that speculation in the commodity derivative markets both resulting in the diminish and enhance the volatility of commodity prices depending on particular types of speculators. By investigating rice prices in three different periods: before and after introducing a future rice contract and then after participating of large institutional speculators, the results show that the rice price volatility decreases at the beginning of its trading in the future markets. However, it then increases again in more frequency but with low amplitudes when non-commercial speculators from large institutional investment dominate the future markets.

The similar results have been found by Algieri (2012) in the studies of the linkages of commodity prices volatility in the one side, and speculative behaviours and excessive speculation in the other sides. Granger causality tests are used with the monthly prices of underlying commodities, namely wheat, rice, maize, barley, soybeans, palm kernel, and palm oil from 1995 to early 2012. The results show that only during the excessive speculation periods, does speculation give rise to the increase in price volatility, while during the normal periods it is likely to reduce. In other words, the speculative behaviours will help to diminish the volatility of commodity prices if they are not too extreme.

3. Commodity Price Risk Implications

Whether supply-demand shocks or excessive speculation behaviours cause the commodity price fluctuation, the results have direct and indirect severe impacts on various stakeholders. However, there are different effects from the price volatility depending on the characteristics of underlying commodities, market structures and the particular roles individuals play in supply chains.

The salient example of the straight implication of price volatility is on farmers and consumers of non-staple agricultural commodity markets, e.g. ginger and garlic markets, in China (Miao *et al.*, 2011). Some traders make unusual profits by stocking a particular non-staple agricultural commodity and then manipulating the market price before selling it back when they have satisfied profits, which turn into dramatic price declines. The

obvious consequence of the volatility of such commodity prices is that consumers have to buy them in unreasonable prices. In addition, it may distort the ability of farmers' decisions in planting crops, as they may lose their investment if they decide to plant more crops based on the temporary high price.

Additionally, Staritz (2012) shows the significant impacts of commodity price volatility on developing countries, in particular for net commodity-importing countries. On account of low incomes, the security of their food and fuel seems impossible and the situation becomes even worse when the commodity prices are more volatile. Nonetheless, even though some commodity-exporting countries benefit from the spikes in their commodity prices, the volatility of the prices also come up with the difficulties in managing the economies.

In addition to direct effect of the commodity price uncertainty, the indirect impacts look serious as well. Commodity price transmission of from international exchange into local markets is a good example. The commodity price from international exchange markets plays a crucial role in hedging from price volatility or as a benchmark price throughout the commodity chains' stakeholders, such as consumers, manufacturers, exporters, primary processors, local traders and farmers. Nevertheless, while prices in international commodity exchange markets have been increasingly volatile in recent years, all actors in the chain have negative impacts as the prices cannot do their own functions properly. Commodity processors confront difficulties to hedge their risk from commodity product procurement or sales, and local traders and farmers cannot use them as the referent prices, for instance. This effect is more severe to commodity chains' players in the up streams as they are inferior in finance, information and risk management tools compared with those in down streams.

Newman (2008) studied the transmission of coffee prices from CBOT into two low-income countries', namely Tanzanian and Ugandan, coffee chains. This research suggests that the prices in the exchange market play a vital role as a benchmark price in the whole coffee chains. However, there are asymmetric impacts from the price transmission on different actors in the chain. Actors in the up streams are more likely to have negative impacts from the price decreases than the positive ones from the increases. In other words, the price in local markets changes faster when the price in the future exchange market goes down than when it go up. Therefore, local traders will get worse if they lack experience of appropriate risk management tools when the coffee price plummets.

Furthermore, stakeholders in the coffee chains have different PRM strategies depending on their price transmission impacts, knowledge, and the accessibility to finance and information. Some local dealers even cheat farmers by adjusting the scale or buyers by adding contaminated products since they lack of knowledge, suitable tools and strategies during the price fluctuation periods (Newman, 2009).

4. Summary

This Appendix provides a review of the literature relating to price risk, as it is the focus of this research, and its implications. It is widely accepted that commodity prices have become more volatile in recent years, especially after the world financial crisis in 2008. Commodity supply chain players are challenged by these market changes. The literature reveals the complexity of this phenomenon due to the vagueness of its causes. Therefore, to address this issue is to question the ability of the supply chain players to manage price risks based on market-based tools.

Appendix E: Interview Guides

Interview Guides

1. How would you describe your business?

2. How would you describe the movements of natural rubber prices in recent years, and how have they changed from previous periods?

3. How do recent price movements impact on your business? (In what way? Why?)

4. Can you give an example of price movement events that make it difficult for you to manage your business? (In what way? Why?)

   4.1 How do you cope?

   4.2 How effective it this?

5. What kinds of price movements are you in favour of? (Why?)

   5.1 How would you deal with them?

   5.2 How effective it this?

6. Price risk of rubber

   6.1 What are the characteristics of price risks that you want to take?

   6.2 What is the extent of price risks that you want to take?

   6.3 What are the factors influencing your decisions in price risk taking?

7. What is the extent of the price risks that you think your business is currently exposed to?

   7.1 How do you know this?

8. What are the factors that drive the movements of natural rubber prices?

9. Who influences the movements of natural rubber prices?

   9.1 To what extent are you able to manage price risks? (How?)

   9.2 Who supports you in managing price risks? (How?)

10. How similar or different are price movements in different markets? (Is this important?) (Why?)

11. How similar or different are price movements in terms of different natural rubber products?
(Is this important?) (Why?)

12. How do you trade in natural rubber? (How effective it is?)

12.1 How do you deal with price risks?

12.2 Who do you decide to sell the natural rubber products to? (Why?)

12.3 How do you receive price information?

12.4 How do you set the buying and selling prices?

12.5 How do expectations of future prices influence your trading decisions?

12.6 How do you predict prices? (How effective it this (are they?)

12.7 How do you use futures markets in your business?

12.8 How do you use Information and Communications Technology (ICT) in your business?

13. What do your decisions in terms of buying or selling natural rubber products depend on? (Why?)

14. What kind of additional tools, price risk instruments and additional support would you like to use in order to help manage natural rubber price risks?

15. What information would you like to add that I have not covered in the previous questions?

Appendix F: Interviewee Duration

Participant	Interview Duration (hh:mm:ss)	Types of rubber and average NR volume traded
RBI 01	00:57:21	Latex (sometimes are processed into RSS)
RBI 02	01:18:42	Latex
RBI 03	00:41:30	Latex
RBI 04	01:02:40	Latex
RBI 05	01:53:52	Cup lump
RBI 06	01:18:21	Cup lump (main) and USS
RBI 07	01:17:00	USS
RBI 08	02:50:15	Latex-RSS
RBI 09	01:18:00	USS (main) and Cup lump
RBI 10	02:43:25	USS (main) and Cup lump
RBI 11	00:50:44	USS and Cup lump
RBI 12	01:47:24	USS and Cup lump
RBI 13	01:42:59	Latex-RSS
RBI 14	01:55:47	USS (main) and Cup lump
RBI 15	01:42:30	USS
RBI 16	01:42:29	Latex-USS
RBI 17	01:38:59	USS (main) and Cup lump
RBI 18	01:01:51	USS (main) and Cup lump
RBI 19	00:54:08	USS (main) and Cup lump
RBI 20	00:39:59	USS (main) and Cup lump
RBI 21	01:39:22	USS (main) and Cup lump
RBI 22	01:45:27	Latex-RSS
RBI 23	01:11:45	USS and Cup lump
RBI 24	00:53:06	Latex-RSS

USS: Unsmoked Sheet

RSS: Ribbed Smoked Sheet

Latex-RSS: Buy latex and process it into RSS

Latex-USS: Buy latex and process it into USS

Appendix G: Pre-interview Questionnaire

Business Demographic Characteristics

Interviewee Background

1. Gender ☐ Male ☐ Female
2. Age……Years
3. Education
   - ☐ A qualification lower than a Bachelor's. Please identify……
   - ☐ Bachelor's Degree: Major…… ……..
   - ☐ Master's Degree: Major…… ……..
   - ☐ PhD: Major…… ……
4. Experience in training relevant to rubber trading…… ……
5. Experience in rubber trading

   Experience in buying rubber…… Years

   Experience in selling rubber…… Years

   Other experience relevant to the Rubber Industry..... Years

Business Background

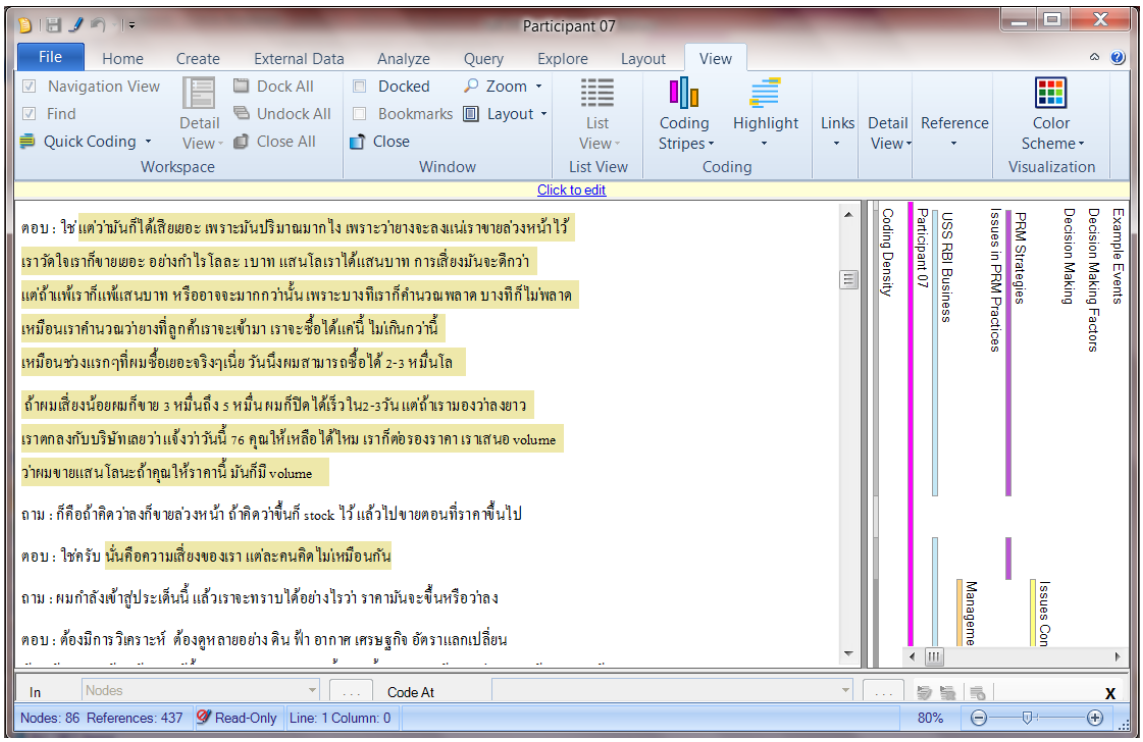
1. Location……
2. The reasons for establishing the business here ……
3. Numbers of employees……people
4. Cash flow……Bath/day
5. Source(s) of Capital

   Source 1 ……Proportion……per cent

   Source 2 ……Proportion……per cent

   Source 3 ……Proportion……per cent
6. Types of Rubber Products and Trading Volume per Day
   - ☐ Rubber Sheet (Average)……Kilos/day
   - ☐ Cup Lump (Average)……Kilos/day
   - ☐ Latex (Average)……Kilos/day
   - ☐ Others Please Identify……Kilos/day
7. Own rubber plantation……Rai
8. Other sources of income ……

Appendix H: Snapshot of NVivo



Appendix I: Example of Interview Transcripts in Thai (RBI07)

ถาม: ก่อนอื่นขอถามโกหน่อย ลักษณะธุรกิจของโกเนี่ย เป็นอย่างไรบ้างครับ

ตอบ: คือลูกค้าที่มาขายทีละพันสองพัน โลไม่มีแล้ว ถ้าจะมีก็เป็นราย ย่อยเยอะ มันเป็นลักษณะอย่างนี้ที่ผมจะโชว์ให้ดูนะ นี่เป็นรายใหญ่นะจาก 400 โล 700 โล นี่เป็นรายใหญ่แล้ว แต่อย่างนี้จะเป็นรายย่อยครับที 90 โล 92 โล 93 โลอย่างนี้เป็นรายย่อย

…

ถาม: … ช่วยขยายหน่อยครับ

ตอบ: ความจริงคือเดิมนี่ อาจจะเป็นแผ่น 100% และก็ในช่วง 10 ปีหลังเนี่ย ก็จะมีเรื่องน้ำยางเข้ามา มันก็เลยทำให้คนหันไปทำน้ำยางใหม่ๆ ก็ทำไม่ได้ พอระยะหลังก็รู้สึก เออ มันมีความสะดวกสบายอะไรอย่างเนี้ย ขายได้เร็วขึ้น ได้เงินเร็ว มันขึ้นอยู่กับความจำเป็นของเขา เดี๋ยวนี้คนอาจจะมีความจำเป็นใช้เงินมาก ใช้เงินบ่อย คือเป้นคล้ายๆ เงินค่าแรงรายวัน ยางแผ่นใช้เวลา 10 วัน

…

ถาม: แล้วการเคลื่อนไหวของราคาเนี่ย ช่วงนี้เป็นอย่างไรบ้างเมื่อเทียบกับปีก่อนหน้านี้ครับ

ตอบ: จริงๆ แล้วระยะหลังนี่ มันวูบวาบเกินไปเคลื่อนไหวขึ้นลงเร็วแรง คือถ้าพูดถึงมันเป็นแต่ละ 10 ปีนะไม่ใช่ 5 ปี 10 ปีแรกๆ ที่ผมทำการค้าเนี่ย บางทีเราขายราคานี้สองสามวันถึงจะมีการเปลี่ยนแปลงทีนึง มันอาจจะเกี่ยวกับข้อมูลข่าวสารในสมัยก่อนไม่ทันสมัยก็ได้ มันไม่มีอินเทอเน็ต ไม่มีอะไร แต่ว่าสิบปีที่สองนี่มันก็เริ่มไปอีกรูปแบบหนึ่ง มันเคลื่อนไหวขึ้นลงอย่างเนี้ยเป็นจังหวะแต่ทุกวันนี้มันเร็ว อาจจะเกี่ยวกับอินเทอเน็ต เรามี เรียลไทม์ ทั่วโลกขยับยังไงมันก็กระเทือนหมดน่ะ

…

ถาม: ราคามันเป็นอย่างนี้มันมีผลกระทบต่อธุรกิจของโกอย่างไร

ตอบ: มันไม่กระทบหรอก มันอยู่ที่จังหวะที่เรามองขึ้นก็ได้ลงก็ได้บริหารได้ อยู่ที่เราดูตลาดมากกว่า หมายความว่า ผมพยายามที่จะพูดในเว็บบอร์ดตรงนี้ ผมจะพูดว่า ราคายางจะขึ้นหรือลงนี่นะ ให้เราทำให้ถูก ถ้าเราคิดว่าคาขึ้นเราก็ซื้อเก็บ สต็อกไว้แล้วค่อยขาย เมื่อเราคิดว่าราคาลงเราก็ตกลงกับบริษัทตกลงกับตกลงขายล่วงหน้าแล้วค่อยส่งมอบ เพราะว่าพ่อค้ายางขึ้นลงผมว่า ไม่ใช่ขึ้นแล้วกำไร ลงแล้วขาดทุนไม่ใช่ ขึ้นขาดทุนก็ได้ ลงกำไรก็ได้

…

ถาม: … ช่วยขยายหน่อยครับ

ตอบ: เราต้องดูทองลงอะไรลง มันต้องดูหมด ผมตื่นมาตี 3 ตี 4 ผมดูดาวน์โจน มาเท่าไหร่ ต้องดูครับ ผมว่าเกี่ยวหมดเพราะมันขึ้นอยู่กับเศรษฐกิจโลก ถ้าเศรษฐกิจดี รถก็ขายได้ จะคันอะไรที่ใช้ยาง มันก็ขายได้ เครื่องบินก็ต้องใช้ล้อ ล้อเครื่องบินใช้ยางล้วนๆ นะครับ ล้อรถยนต์ยังใช้น้อยกว่า โรคภัยไข้เจ็บก็ทำให้ยางราคาดี ก็พวกถุงมือยาง ถุงยางอนามัย มันมีส่วนทั้งนั้น ผมพูดได้เลยว่า เศรษฐกิจโลกเป็นตัวกำหนด

…

ถาม: ใครมีอิทธิพลต่อการเคลื่อนไหวของราคายาง… แล้วพ่อค้าคนกลางมีส่วนไหมครับ

ตอบ: ถ้าโดยรวมนี่ พ่อค้าคนกลาง จริงๆแล้วพ่อค้าคนกลางเป็นคนที่เป็นส่วนหนึ่งของกลไกตลาด ส่วนหนึ่งของกระบวนการ ถามว่าชาวสวนมียางเล็กๆ น้อยๆ คุณจะไปขาย ณ โรงานได้ไหม คุ้มไหม พ่อค้าคนกลางเป็นจุดรวมในหมู่บ้าน ในท้องถิ่น ชื่อของเขาบอกอยู่แล้วว่าเป็นพ่อค้าคนกลาง ถ้าไม่มีพ่อค้าคนกลางชาวสวนจะขายยังไง เพราะว่ามีปริมาณน้อย พ่อค้าคนกลางก็มีหลายระดับ โรงงานก็เอาใจใส่ตาม พาวเวอร์ ของพ่อค้าคนกลางตามโวลุ่มที่ซื้อได้ โรงงานเขาก็แบ่งเหมือนกัน รายรถกระบะ ราย 6 ล้อ รายรถพ่วง เขาก็แบ่งตามโวลุ่มในราคาไม่เหมือนกัน

…

ถาม: ปัจจัยอะไรที่ส่งผลต่อคุณในการตัดสินใจเสี่ยงทางด้านราคายาง

ตอบ: มันก็ได้เสียเยอะ เพราะมันปริมาณมากไง เพราะว่ายางจะลงแน่เราขายล่วงหน้าไว้ เราวัดใจเราก็ขายเยอะ อย่างกำไรโลละ 1 บาท แสนโลเราได้แสนบาท การเสี่ยงมันจะดีกว่า แต่ถ้าแพ้เราก็แพ้แสนบาท หรืออาจจะมากกว่านั้น เพราะบางทีเราก็คำนวณพลาด บางทีก็ไม่พลาด เหมือนเราคำนวณว่ายางที่ลูกค้าเราจะเข้ามา เราจะซื้อได้แค่นี้ ไม่เกินกว่านี้ เหมือนช่วงแรกๆที่ผมซื้อเยอะจริงๆเนี่ย วันนึงผมสามารถซื้อได้ 2-3 หมื่นโล ถ้าผมเสี่ยงน้อยผมก็ขาย 3 หมื่นถึง 5 หมื่น ผมก็ปิดได้เร็วใน 2-3 วัน แต่ถ้าเรามองว่าลงยาว เราตกลงกับบริษัทเลยว่า แจ้งว่าวันนี้ 76 คุณให้เหลือได้ไหม เราก็ต่อรองราคา เราเสนอโวลุ่มว่าผมขายแสนโลนะ ถ้าคุณให้ราคานี้มันก็มีโวลุ่ม

…

ถาม: คุณจัดการความเสี่ยงทางด้านราคายางอย่างไร

ตอบ: ถ้า 30 กว่าปีนี่ก็ถ้าผิดนี่มันเกิน 100 ครั้งแล้ว แต่ถ้าถามถูกล่ะ มันถูกมากกว่า เพราะฉะนั้นเราต้องคิดว่าเราทำให้ถูกมากกว่าทำให้ผิด อย่าไปคิดอย่าไปจมกับมัน อย่าไปเสียใจนับหนึ่งใหม่ เริ่มใหม่มันเหมือนกับพวกเล่นหุ้นแต่ว่าเราซื้อยาง อย่างพวกเล่นหุ้นวันนี้ตลาดไม่หนีไปไหน วันนี้คุณไม่ซื้อคุณก็ซื้อวันที่คุณแน่ใจก็ได้ ยางก็เหมือนกันยางไม่หนีไปไหน วันนี้คุณไม่ได้กำไร เดี๋ยวมันก็ต้องได้กำไรสักวัน เพราะว่ามันยังเข้ามาอยู่เราก็ยังซื้ออยู่

…

ถาม: คุณตัดสินใจขายยางให้ใคร เพราะเหตุผลอะไร

ตอบ: เราก็ต้องไปที่คิดออกมาแล้วได้ราคาสูงที่สุด เปรียบเทียบกัน ค่าขนส่งนั่นตายตัวอยู่แล้ว แต่ว่าเราจะดูจากสมมุติฐานของแต่ละโรงงานบางทีเปิดราคาไม่เหมือนกัน เปิดราคาไม่เหมือนกัน คนที่ตีคุณภาพไม่เหมือนกัน ตีคุณภาพนี่หมายความว่าเจ้านี้อาจจะดูยางชนิดนี้ 3% อีกบริษัทหนึ่ง อาจจะดู 3.2% ความชื้นไม่เหมือนกันในสายตาแต่ละโรงงาน หรือว่านโยบายของแต่ละบริษัท ของแต่ละโรงงาน

…

ถาม: … ช่วยขยายหน่อยครับ

ตอบ: คือเรื่องน้ำหนักเรื่องกิโล หมายความว่าตาชั่งมาตรฐาน การวัดน้ำหนัก บางทีเราไปรถหกล้อน้ำหนักประมาณ 9-10 ตัน บางแห่งก็อาจจะขาดน้อยหน่อย คือขาดแน่อยู่แล้ว 10-20 โล แต่บางแห่งก็อาจจะขาดถึง 50 โล นโยบายเขามันเกี่ยวกับคนทำ บางทีตาชั่งมันอาจจะไม่ขาดก็ได้ แต่ว่าพาเลท พาเลทมันไม่สมบูรณ์ โรงงานตั้งมา 20 ปีแล้ว บางทีเขาชั่งพาเลทไว้เขา มาร์ค พาเลทไว้ พาเลทอันนี้ 100 กิโลนะ อย่างนี้ 50 กิโลนะ แต่ว่าบางทีเหล็กหลุดไป 1 ชิ้นก็ยัง 50 โล เหล็กหลุดไป 2 ชิ้นก็ยัง 50 โล แต่พอเราพูดบริษัทก็เฉยๆ บางทีเราก็คิดว่าเราเสี่ยงเล็กเสี่ยงน้อย เราก็ต้องมาคำนวณว่าไปโรงนี้แล้วขาดเท่านี้ ส่วนมากเราจะรู้น่ะ

…

ถาม: … เมื่อกี๊ถามถึงว่าโกดุ่ยตัดสินใจขายยางให้ใครเพราะเหตุผลอะไร

ตอบ: เราต้องคิดออกมาก่อนว่าอันไหนออกมาได้เยอะกว่า ถ้าอันไหนออกมาได้เยอะกว่าเราก็มาดูความใกล้ความไกล เราวิ่งไปใกล้หรือไกล เราต้องดูตัวนั้นด้วยเอามาประกอบกัน นี่เขาก็โทรมาถามว่าจะซื้อยังไง ขายยังไง ถ้าเท่ากันเราก็ดูว่าส่งที่ไหนใกล้ที่สุด มันก็ เซฟ ค่าน้ำมัน ค่าระยะเวลา บางครั้งก็ไม่จำเป็น แต่ว่าก็ต้องคิดมาแล้วให้มันอยู่ตรงนั้น

…

ถาม: คุณใช้ประโยชน์ตลาดล่วงหน้ายางพาราอย่างไร

ตอบ: ถ้าถามว่าไปเล่นในตลาดล่วงหน้าผมไม่ค่อยเชียร์เลย เพราะผมเคยแพ้มาแล้วเพราะว่าตลาดล่วงหน้าของไทย เอเฟต เนี่ย มันไม่ได้เป็นไปในทิศทางของความเป็นจริง … ตลาดมันยังมีการครอบงำอยู่ มันไม่โปร่งใส ตามความเข้าใจของผมนะ

…

ถาม: คุณใช้ประโยชน์จากเทคโนโลยีอย่างไรบ้าง

ตอบ: เดี๋ยวนะจะให้ดูกราฟ เห็นมั้ยเดี๋ยวนี้พ่อค้ากับ เทคโนโลยี คุณจะว่ามันยังไง มันก็ลงอย่างเนี้ย นี่คือ โตค่อม โตค่อม คือ โตเกียวคอมมิวตี้ มันลงมาที่ 239 แล้วก็มา รีบาวน์ ขึ้นมา เมื่อวานรู้สึกจะล่าสุดเท่าไหร่ 245.7

…

ถาม: คุณมีข้อเสนอแนะอื่นๆ หรือไม่ เกี่ยวกับการจัดการความเสี่ยงทางด้านราคายาง เพื่อให้งานวิจัยนี้มีความสมบูรณ์ขึ้น

ตอบ: เป็นพ่อค้ายางถ้ารู้จักดูตลาด รู้จักซื้อขายราคาล่วงหน้า หรือว่าตัดสินใจในการวิเคราะห์ราคาตลาดไม่จำเป็น ราคาขึ้นกำไรก็ได้ ราคาลงกำไรก็ได้

Appendix J: Example of Interview Transcripts Translated into English (RBI07)

Q: How would you describe your business?

A: There are no suppliers who sell me 1,000 or 2,000 kgs a time any more. There are many smallholders. I am going to show you this in my account book. These are my big customers selling from 400 to 700 kgs, and these are a lot more small customers selling just 90, 92 or 93 kgs.

...

Q: … Please tell me more.

A: In the early days, almost 100 percent of what farmers produced was USS. The latex market was only introduced 10 years ago and it did not work well at the beginning. Nevertheless, farmers later acknowledged that it was convenient in terms of quickly producing and selling what they produced which met their needs. Today, people need more money and need it more frequently. However, USS production requires ten days.

...

Q: How would you describe the movements of natural rubber prices in recent years, and how have they changed from previous periods?

A: Actually, in recent years, price movements have been too volatile. In the early years of my trading, sometimes price changed once in a few days. It may be relevant to the information. Technology was not advanced in those days. There was no internet. Later on, prices started moving more often than before, but not as quickly as today. It may be because of the internet. Now, we have real time worldwide; so, any movement affects all.

...

Q: How do recent price movements impact on your business?

A: The price movement does not impact on my business. Whether prices climb or dive, we can manage them. Our profits depend upon our market analysis. I would say that whether the price goes up or down, if you manage it right, you will make profits. If I think the price will rise, then I buy and stock it [USS], and wait to resell it later. If I think it will drop, I will arrange a forward selling agreement with a company [processor] and deliver it later. Because we are a merchant [RBI], the increased price does not mean gains and, in contrast, the decreased price does not mean losses. On the other hand, we may make a loss from rising prices and make a profit from falling prices.

...

Q: … Please tell me more.

A: We [RBIs] have to follow many things such as the gold price and the Dow Jones. I wake up at 3 or 4 AM in order to see the current Dow Jones index. We have to know it. I think them all relevant to rubber prices. If the world economy is good, cars will be good to sell. Whatever is made from rubber can be sold. Airplanes also use wheels made from rubber. I think the world economy influences the rubber prices.

…

Q: Who influences the movements of natural rubber prices? … Please tell me more about the role of RBIs.

A: Generally, RBIs are actually a part of the market mechanism. Since farmers have a small amount of NR products, is it worth selling the products directly to NR processors? RBIs provide collecting points in villages or local areas. As the name suggests, we are intermediaries. Without RBIs how would NR farmers market their produce because they had produced only small amount? There were different sizes of RBI businesses that NR processors paid different amounts of attention to. The processors classify RBIs as the sourcing power in terms of the product volume they could buy and deliver, such as by a pickup RBI, a six wheel truck RBI or a trailer RBI. They give different buying prices depending on volume.

…

Q: How do you deal with price risks?

A: Using a forward contract as a speculation results in big gains or losses because of the high volume of trade. If we think that prices will go down we will sell in advance and if we are very certain, we will sell it in big volume. For example, if it makes a profit of one Baht/kg for 100,000 kgs, we will make a profit of 100,000 Baht. If we make losses we will lose the similar amount as well or, sometimes, more than that. I have to calculate the amount of incoming NR products that could be bought for a certain time. Sometimes, I have miscalculated it. In the early years of my NR trading, I could buy it at around 20,000 - 30,000 kgs a day. If I would like not to take too high risks, I will sell about 50,000 in advance. So, I can buy to cover it within two or three days. If I think prices will decrease in the longer term, I will manage to negotiate with the processors for the higher price. For example, I offer them for 100,000 kg and see whether they can give me better prices as I trade in a high volume.

…

Q: What are the factors influencing your decisions in price risk taking?

A: If I counted for over 30 years of my trading, there would be over 100 times that I made losses. However, the right decisions far outnumber the wrong ones. I do not worry about it if a decision was wrong. You can do it again like traders in the stock markets, but we [RBIs] trade rubber. Markets are always there; so, if you are uncertain about the market today, you can wait for whenever you are certain. If you cannot make profits today, you will make them one day. This is because there will always be a market for the rubber produced by the farmers.

...

Q: Who do you decide to sell the natural rubber products to? Why?

A: I have to calculate which buyer will give me the highest price. For me the transport costs are similar for every buyer. So, firstly, I consider their offered prices which are sometimes different. Secondly, the graders of the different buyers grade my rubber sheets differently. For example, one grader may grade it as having a moisture content of 3% while another may grade it as 3.2%. It depends on their policy.

…

Q: … Please tell me more.

A: It is the issue of scale that is the standard of weight measurement. Sometimes, I deliver it by a six-wheel lorry whose capacity is about 9,000 - 10,000 kgs. Some processors' scales are inaccurate by around 10 – 20 kgs. In fact, some processors could measure a weight up to 50 kgs less than I did. It isn't only about the scale's accuracy. It includes many factors. For example, the pallets can be incomplete. The factory may have been established for 20 years. Originally, some of them were marked as 100 kgs in weight and some as 50. With time passing, some of their parts were lost but it they may still use the 50 or 100 as its weight. I argued with them several times, but they have still done nothing. So, I think it is a small risk that I have to be exposed to. However, I can estimate it in advance to make the decision about selling.

…

Q: ... Please tell me more.

A: After I compare who offers me the best price, I consider the distance between my shop and the buyers' location. I have to consider it as a part of my decision because a closer buyer means that I can save in fuel costs.

...

Q: How do you use futures markets in your business?

A: If you ask me that whether we should participate in AFET, I do not really support the idea. This is because I used to get huge losses from trading in the AFET. … It is because of the low trading volume. So, it could be easy to manipulate the market.

…

Q: How do you use Information and Communications Technology (ICT) in your business?

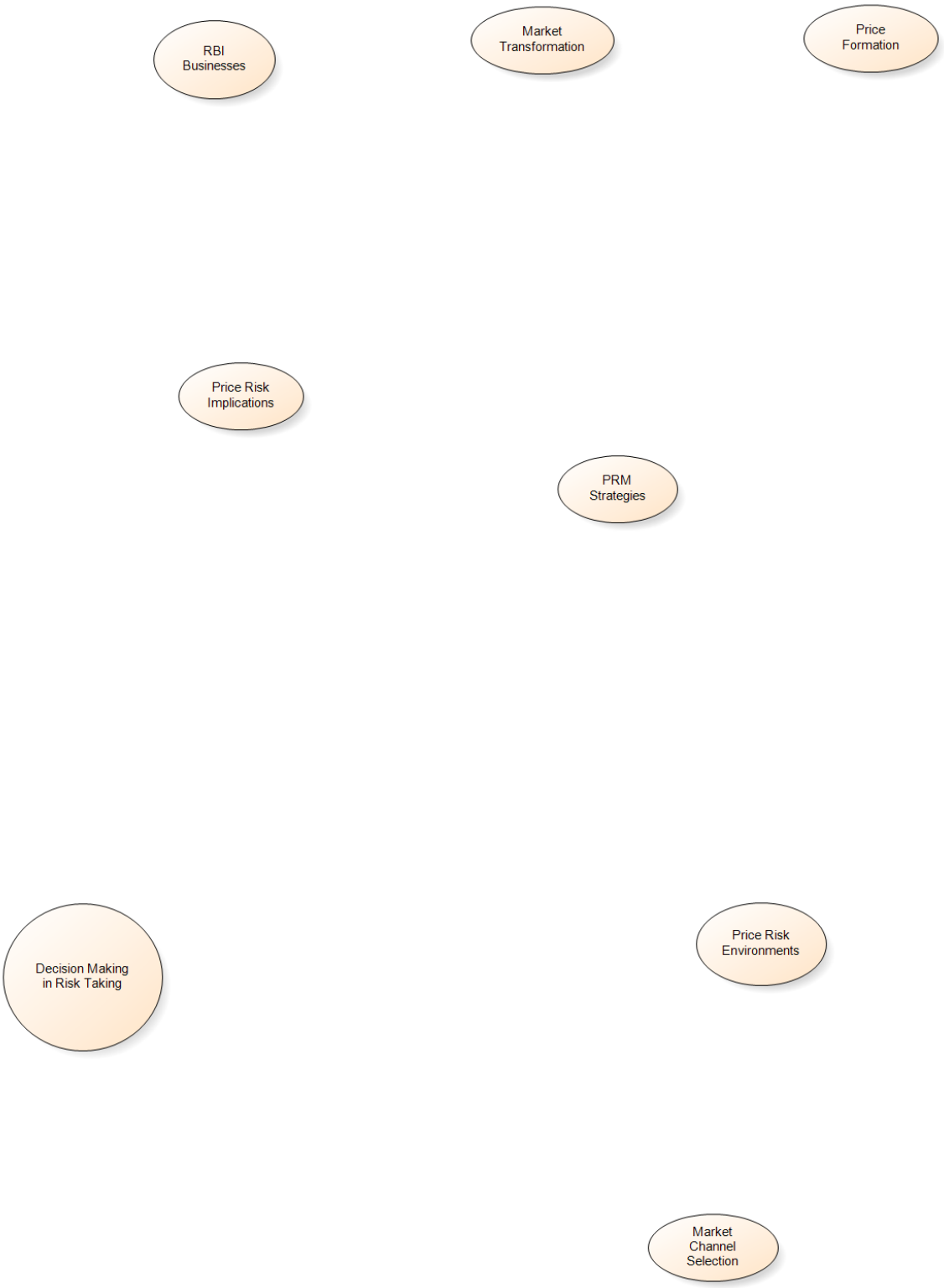
A: I'm going to show you the graph. You can see merchants [RBIs] and technology now. This is TOCOM. TOCOM is the Tokyo Commodity Exchange. The price dropped to 239 [Yen] and then rebounded to, the latest yesterday, 245.7.

…

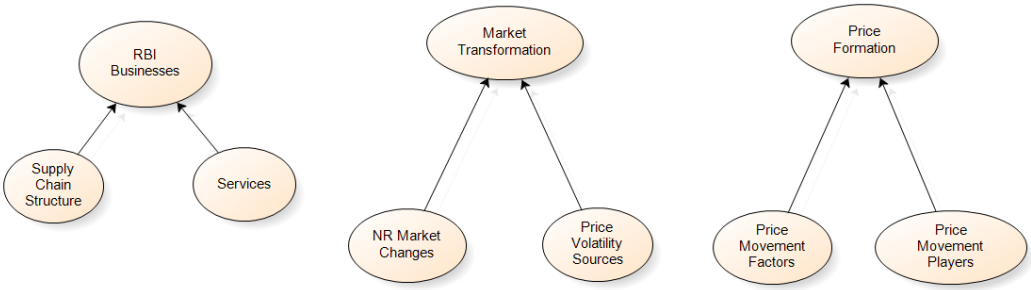
Q: What information would you like to add that I have not covered in the previous questions?

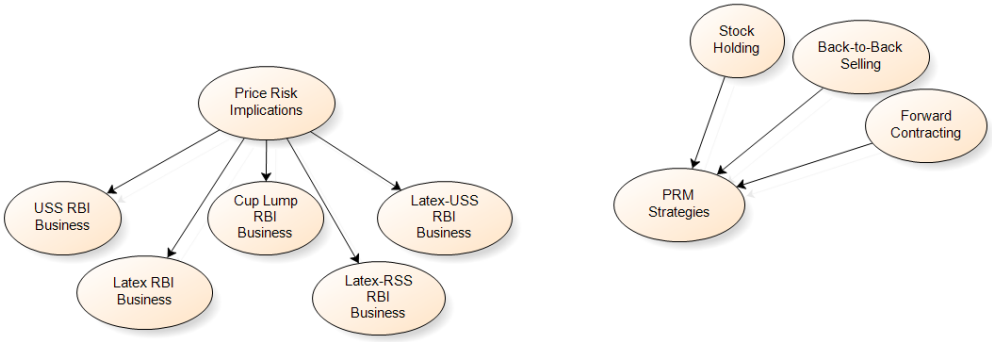
A: To be a rubber merchant, you have to know how to analyse the market, know how to trade in forward contracts. It is not necessary to [have] increasing prices to make profits, decreasing prices [can] make them as well.

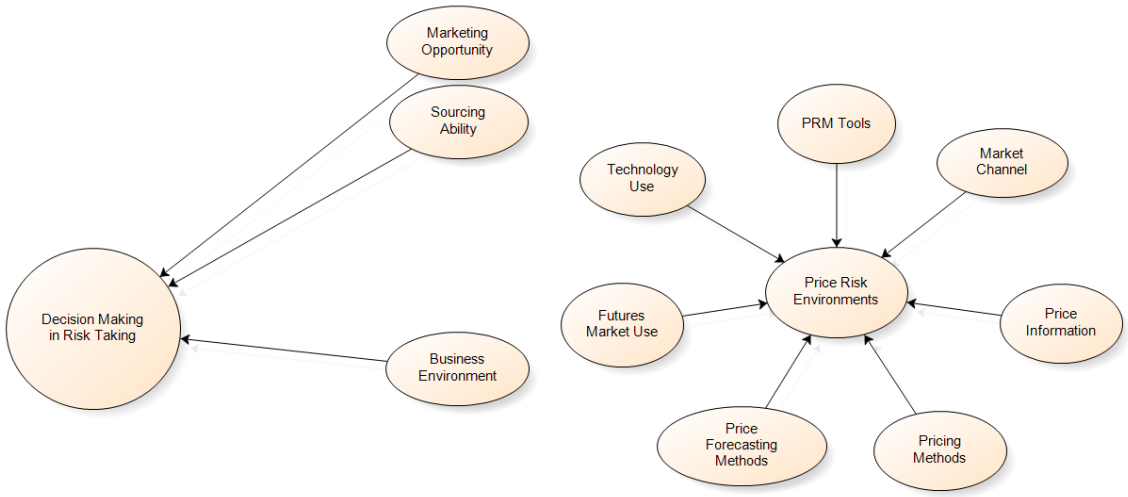
Appendix K: The A Priori Code

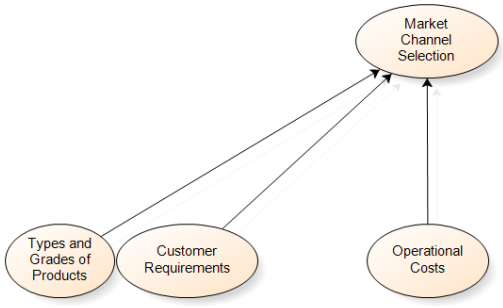


Appendix L: The Initial Template

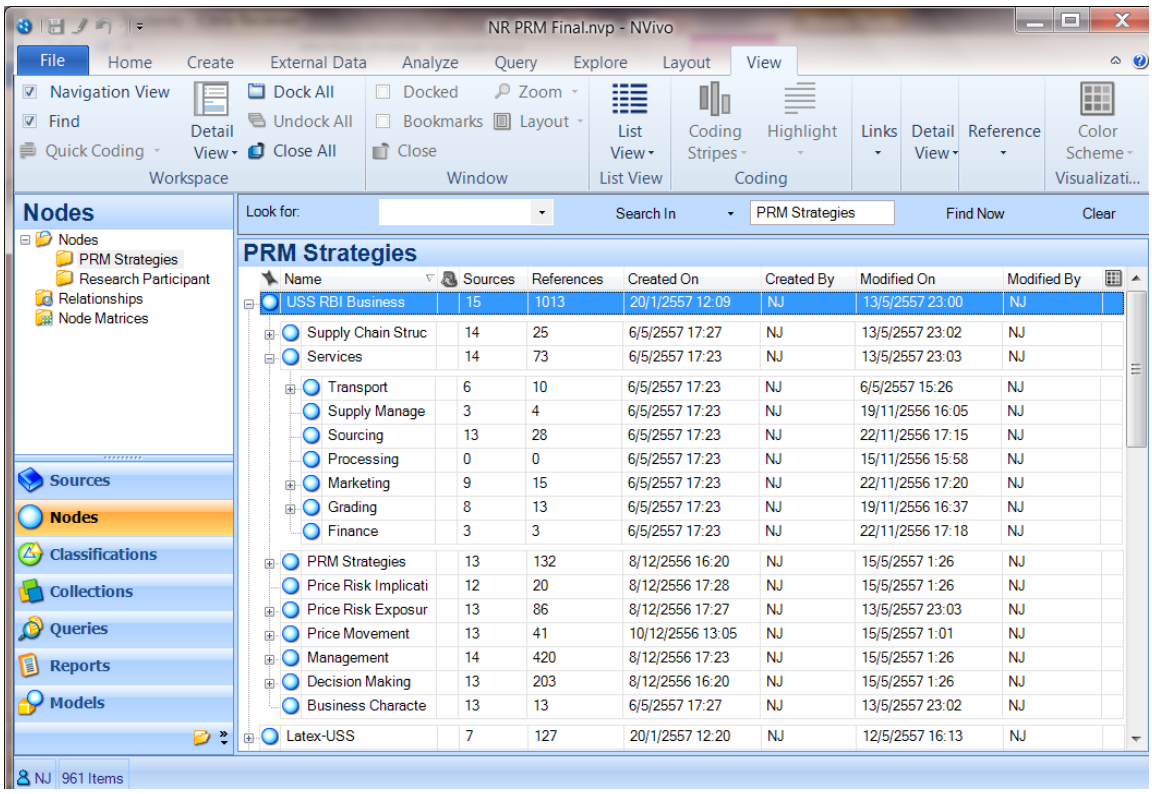




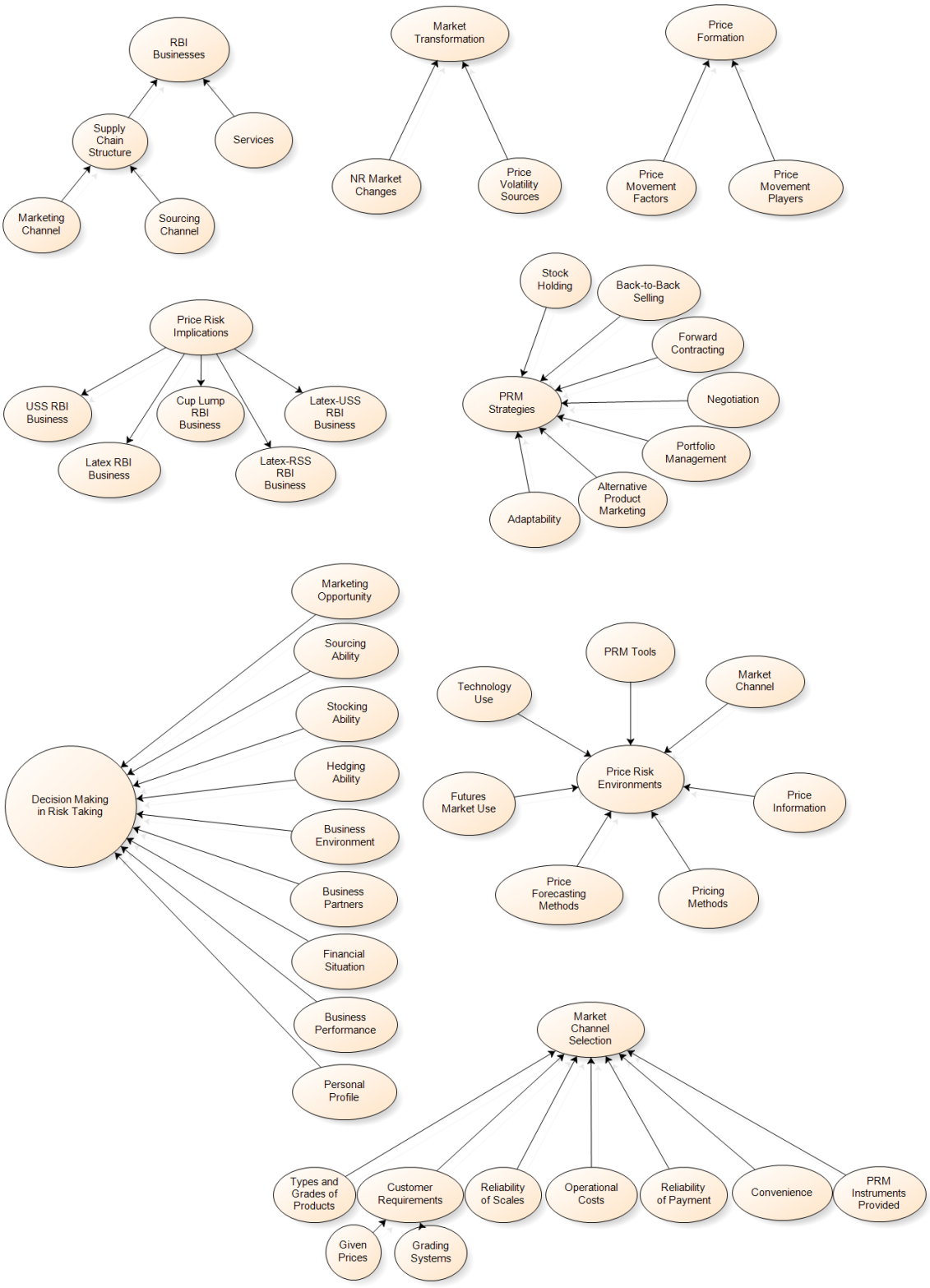




Appendix M: Example of Coding Three



Appendix N: The Final Template



Appendix O: Example of Data Translation

Original Quotation from the interviewee in Thai	Translation the Original Quotation in Thai into English by the Researcher
“การแข่งขันสูงมากเลย แต่ละเจ้านี้มีตังทั้งนั้น บางคนยอมขาดทุน เดี๋ยวนี้ตามลานยอมขาดทุนเอาลูกค้าไว้ เอาลูกค้าไม่เอาตังก็มี อย่างนี้เลย ไม่ยอมเสียลูกค้าแต่ยอมเสียเงิน เราต้องเสี่ยง เพราะว่าเราลงทุนไปเท่าไรกี่ล้านแล้ว ถ้าเราไม่ทำรถอะไรเลย ลงทุนไปแล้วต้องทำ เมื่อก่อนกำไรเดือนหนึ่ง 200,000 แต่เดี๋ยวนี้กำไรเดือนหนึ่ง 10,000, 20,000 ก็เอาแล้วไว้พอซื้อกับข้าวให้ลูกกินก็พอแล้ว” (RBI01).	“It is very highly competitive in the market now. Some of them [RBIs] admit to accepting loss in order to retain customers. They don’t want to lose customers but accept losing money. I have to take risk as I invest in infrastructure, such as lorries, for several million Baht. Previously, I could make profits of 200,000 Baht a month, now I get just 10,000 or 20,000 if I am lucky. It is just enough to feed my children.” (RBI01)
“มันไม่เหมือนขี้ยาง มันไม่เหมือนยางแผ่น ที่คุณเข้าไปเขาเช็คความชื้นแค่อย่างเดียว แต่น้ำยางนี้มันไม่ใช่ น้ำยางนี่คือแบบ มันต้องมีสารเคมีไปผสม อะไรหลายๆอย่าง แต่ขี้ยางนี้ไม่ต้องมานั่งเช็ค เหมือนยางแผ่นมันก็แห้งอยู่แล้ว ก็คือเก็บไว้ได้เป็นเดือน สองเดือนก็ พ่อค้าคนกลางก็ปล่อยได้” (RBI03).	“Unlike cup lump or rubber sheet in which the quality is identified by moisture measurement, latex needs more measurements. It needs to be mixed with some chemicals to preserve it. Cup lump doesn’t need to be tested. As far as rubber sheets are concerned, it is already dry, so it can be stocked for months before reselling it.” (RBI03)
“เราสามารถตักตวงราคาที่เราเห็นได้ว่ากำไรเราก็ขายได้แล้วไม่เป็นไร แต่ถ้าเกิดว่ากลัว กลัวมันลง แล้วค้างเอาไว้ ลงแล้วไม่ยอมขึ้นเลย อย่างนั้นก็เท่ากับว่าเก็บของไว้นาน สินค้าที่เราเก็บไว้นาน น้ำ เปอร์เซ็นต์ความชื้น มันขาดไปเยอะ แห้งไปเยอะ ละลายไปกับอากาศ กับน้ำเนี่ยเยอะ อย่างนี้เนี่ยมันพ่อค้าจะลำบากนิดหนึ่ง ” (RBI05)	“If I can make a profit for my bought cup lump, I will sell it. I do not mind if it is just a small profit because I am afraid when prices decrease for long time. In this case I have to stock for a long time and it will lose a huge weight due to the loss of water resulting from evaporation from cup lumps. It will get too dry. It makes it difficult for me to market it.” (RBI05)

Original Quotation from the interviewee in Thai (cont.)	Translation the Original Quotation in Thai into English by the Researcher (cont.)
“จริงๆแล้วระยะหลังนี่ มันวูบวาบเกินไป ปีแรกๆ ที่ผมทำการค้าเนี่ย บางทีเราขายราคานี้ สองสามวันถึงจะมีการเปลี่ยนแปลงทีนึง มันอาจจะเกี่ยวกับข้อมูลข่าวสารในสมัยก่อนไม่ทันสมัยก็ได้ มันไม่มีอินเตอร์เน็ต ไม่มีอะไรแต่ว่าสิบปีที่สองนี่มันก็เริ่มไปอีกรูปแบบหนึ่ง มันเคลื่อนไหวขึ้นลงอย่างเนี้ยเป็นจังหวะ แต่ทุกวันนี้มันเร็วอาจจะเกี่ยวกับอินเตอร์เน็ต เรามี เรียลไทม์ทั่วโลกขยับยังไงมันก็กระเทือนหมดน่ะ” (RBI07)	“Actually, in recent years, price movements have been too volatile. In the early years of my trading, sometimes price changed once for a few days. It may be relevant to the information. Technology was not advanced in those days. There was no internet. Later on, prices started moving more often than before, but not as quickly as today. It may be because of the internet. Now, we have real time worldwide; so, any movement affects all.” (RBI07)
“พี่ว่ามันอยู่ที่การเก็งราคาให้ถูกมากกว่า ความเสี่ยงมีตลอด เพียงแต่ว่าถ้าเราเก็งถูกมันก็กลายเป็น กำไร ทำยางราคาจะขึ้นหรือจะลงก็ได้ แค่เก็งให้ถูกแค่นั้นพอ ก็คือให้ขึ้นลงเยอะๆ แต่ถ้าเกิดทำผิดทางก็ขาดทุนเหมือนกัน ต้องอยู่ที่ว่าเราอ่านตลาดถูกไหม” (RBI10).	“I think it depends on the right speculation. There are price risks all the time, but if we can deal with them, they will become profits. Trading in rubber can make profits from either price increase or decrease, what you have to do is to speculate in the right direction. However, if you do it wrong, you will make losses. It depends upon whether you analyse the market correctly.” (RBI10)
“โวลุ่ม ก็เป็นสิ่งสำคัญ ถ้าเราเอาเข้าโรงงานเล็กๆ เขาก็ไม่กล้าหักเปอร์เซ็นต์เรา เพราะถ้าเกิดว่าเราเหมือนเราไปเดือนหนึ่ง 300 ตัน ถ้าคุณกดฉัน ฉันก็ไปที่อื่น แต่ถ้าเดือนหนึ่งคุณเข้า 15 ตัน กดไปเถอะ ลูกค้าขนาดนี้คุณไปฉันก็ไม่แคร์ใช่ไหม เรื่องโวลุ่ม ก็สำคัญ” (RBI11).	“The traded volume is important. For example, if you sell cup lump to small processors and trade with them 300 tons per month, they will not be brave enough to discount your DRC from the actual. But if your monthly trade is only 15 tons, they will discount your DRC without any hesitation.” (RBI11)

Appendix P: Contact Letters with RBIs

Faculty of Engineering and Environment

This matter is being dealt with by:
Professor David Wainwright
Principal Supervisor

Pandon Building
Camden Street
Newcastle upon Tyne
NE2 1XE

Dear Sir/ Madam,

Rubber Business Intermediary

Request to Conduct Research

My name is Mr Nontasak Janchum. I am a PhD student within the Faculty of Engineering and Environment, Department of Mathematics and Information Sciences, Northumbria University, United Kingdom. Working under the supervision of Professor David Wainwright and Dr. Andrew Robson, I am doing a research project in the topic of "Price Risk Management Strategies in the Natural Rubber Industry: A case study of Rubber Business Intermediaries in Thailand", which is a project based in the information management innovation (IMI) research group: www.northumbria.ac.uk/imi.

The main aim of the research is to explore the current practice of rubber business intermediaries in price risk management regarding marketing channels, price risk management instruments, hedging, forecasting, pricing methods and futures market use. The research findings will enable a more comprehensive understanding of rubber business intermediaries' price risk management in practices which, later, may lead to more effective measures for helping them to sustain the Thai natural rubber industries as an economic sector.

In this connection, it would be highly appreciated if you could permit Mr Janchum to interview you, as you have experience of managing a business with natural rubber price fluctuations over recent years. By involving you with this research project, the rubber business intermediaries will mainly be asked to participate in an interview about price risk attitudes, perceptions, risk-taking intentions and price risk management practices. The research project will take place between June and July 2013. All ethical guidelines and procedures (as defined by Northumbria University) relating to research data confidentiality will be followed.

Thank you very much for your kind support and cooperation.

Yours sincerely,

Professor David Wainwright
Principal Supervisor
Northumbria University
Email: david.wainwright@northumbria.ac.uk
Telephone: +44 (0)191 243 7634

Mr Nontasak Janchum
PhD student
Northumbria University
Email: nontasak.janchum@northumbria.ac.uk
Telephone: +44 (0) 740 273 5227

Appendix Q: Information Sheet

Faculty of Engineering and Environment
Department of Mathematics and Information Sciences

Information Sheet - PhD research project - Nontasak Janchum

What is the nature of the research project?

I am Nontasak Janchum, a PhD scholar in the Information Management Innovation (IMI) Research Group: www.northumbria.ac.uk/imi, which is part of the Faculty of Engineering and Environment, Northumbria University, United Kingdom. The PhD is based on the research project with the title "*Price Risk Management Strategies in a Natural Rubber Industry: A case study of Rubber Business Intermediaries in Thailand*". Central to this study is my area of research interest in commodity price risk assessment and management.

Aims of the research project

This research aims to investigate how well the rubber business intermediaries can manage natural rubber price risk which is considered as a challenge within these roles and marketplaces. The project will aim:

- To explore the current practice of rubber business intermediaries in price risk management regarding marketing channels, price risk management instruments, hedging, forecasting, pricing methods and futures market use,
- To investigate the differences between natural rubber prices risk between in rubber business intermediaries' perceptions and in reality,
- To investigate the relationship between rubber business intermediaries' attitudes toward risk and their actual practices.

What are benefits to participants in involving in the research?

In Thailand, natural rubber is one of the main exported agricultural commodities which generates revenue of the order of hundreds of billions Baht annually. The sustainability of natural rubber industries is therefore very important within the Thai economy. The research findings will provide a more comprehensive understanding of rubber business intermediaries' price risk management in practice which, later, may lead to the proper measures of helping them to sustain the Thai natural rubber industries.

What are the participants being asked to do?

The research project will take place between June and July 2013. I am hoping that at least 20 rubber business intermediaries, who trade natural rubber products in Southern Thailand, will participate in the research. The volunteer participants will mainly be asked to participate in an interview about their price risk attitudes, perceptions, risk-taking intentions and price risk management practices, which will last no more than one hour.

In providing this correspondence, I would be grateful if you could be one of the research participants in this study.

Data and participant confidentiality

The interview will be audio recorded. The audio files and transcriptions will be kept secure on a computer with access only by password and the computer will be securely held. Only I as the researcher will be permitted access and the data will be deleted permanently after the research is completed. All data and information collected will be managed confidentially. The name of the rubber business intermediaries will remain anonymous.

A written summary of the research findings will be posted to you if you request these.

The University staff member who is the lead supervisor of my research is:

Professor David Wainwright
Director of the Information Management Innovation (IMI) Research Group
Past President (2008-2010) of the UK Academy for Information Systems (UKAIS)
Department of Mathematics and Information Sciences
Faculty of Engineering and Environment (Information Sciences)
Northumbria University, Pandon building, Camden Street, Newcastle upon Tyne, NE2 1XE
UK
Telephone: +44 (0)191 243 7634
Fax +44 (0) 191 243 7630
Email: david.wainwright@northumbria.ac.uk

I look forward to hearing from you and hopefully you will be interested and able to participate in my study.

Yours sincerely,

Mr Nontasak Janchum
PhD scholar
Information Management Innovation (IMI) Research Group
Department of Mathematics and Information Sciences
Faculty of Engineering and Environment (Information Sciences)
Northumbria University, Pandon building, Camden Street, Newcastle upon Tyne, NE2 1XE
UK
Telephone: +44 (0) 740 273 5227
Email: nontasak.janchum@northumbria.ac.uk

Appendix R: Consent Form

Northumbria University
CEIS Research Ethics Sub-Committee
CONSENT FORM – C

Project Title:

Name of the Researcher or Project Consultant:

Name of participant:

Participating Organisation:

I consent to take part in this project.	☐
I have had the project explained to me by the researcher/ consultants **and been given an information sheet**. I have read and understand the purpose of the study.	☐
I am willing to be interviewed.	☐
I understand and am happy that the discussions I will be involved in may be audio-taped and notes will be taken.	☐
I understand I can withdraw my consent at any time, without giving a reason and without prejudice.	☐
I know that my name and details will be kept confidential and will not appear in any printed documents.	☐

- The tapes and any personal information will be kept secure and confidential. They will be kept by the researcher/project consultants until the end of the project. They will then be disposed of in line with Northumbria University's retention policy.
- Anonymised summaries (if required) will be produced from the discussions to be used in the project report and in other publications. None of the participants will be identified in the project report or in other publications based on this project. Copies of any reports or publications will be available on request to participants.

I have been given a copy of this Consent Form.

Signed: **Date:**

Researcher/Project consultant: I confirm that I have explained the project to the participant and have given adequate time to answer any questions concerning it.

Signed: **Date:**

Appendix S: Quotations from Interview Transcripts in Chapter Four

Quotation No.	Quotations from Interviews
APPX_S_401	*"In the early days, almost 100 per cent of what farmers produced was USS. The latex market was only introduced 10 years ago and it did not work well at the beginning. Nevertheless, farmers later acknowledged that it was convenient in terms of quickly producing and selling what they produced which met their needs. Today, people need more money and need it more frequently. However, USS production requires ten days." (RBI07)*
APPX_S_402	*"I buy USS from at auction [a central market]. I have a contract for a high price before buying USS from the central market in order to make profits from the differences in price between them." (RBI12)*
APPX_S_403	*"Generally, RBIs are actually a part of the market mechanism. Since farmers have a small amount of NR products, is it worth selling the products directly to NR processors? RBIs provide collecting points in villages or local areas. As the name suggests, we are intermediaries. Without RBIs how would NR farmers market their produce because they had produced only small amount?" (RBI07)*
APPX_S_404	*"Buying NR products from NR plantations will mean a lower price because we provide door-to-door services. Another reason is the competition. RBIs who offer the door-to-door services will get higher buying volume than those which do not." (RBI11)*
APPX_S_405	*"The profit margin is really low. If I adopt back-to-back selling, I will get 0.20 – 0.30 Baht per a kilo [relative to the price of 70 Baht/kg]." (RBI11)*
APPX_S_406	*"When the prices are low, I will buy USS from farmers and stock it. I will then wait for higher prices before I sell it." (RBI23)*
APPX_S_407	*"There are more NR products produced. However, there are also more RBIs. Therefore, they have to compete with each other for customers." (RBI03)* *"Sometimes, my suppliers can buy less latex because they are competing with Latex-RSS intermediaries. They usually fight for the latex intermediaries' market shares." (RBI04)*

Quotation No.	Quotations from Interviews
APPX_S_408	*"When some denatured latex contaminates the trailer's tank, it affects all the latex in the trailer. 30,000 kilos of latex in the tank will be degraded. It depends on how much it is denatured. The price is lower according to the level of latex quality." (RBI01)*
APPX_S_409	*"Some of my suppliers [Tier 2 latex intermediaries] cannot wait for quality testing as they have to make two or three delivery trips a day. They argued that other latex collecting points do not have to wait for this. Therefore, I have to skip this process which may lead to the risk of latex contamination due to denatured latex. If it happens, 30 tons of latex in a tank will be wasted." (RBI04)*
APPX_S_410	*"I have not received the selling price yet today. I have to buy at the price that I speculated. As a result, I sometimes lose." (RBI04)*
APPX_S_411	*"The traded volume is important. For example, if you sell cup lump to small processors and trade with them 300 tons per month, they will not be brave enough to discount your DRC [dry rubber content] from the actual. But if your monthly trade is only 15 tons, they will discount your DRC without any hesitation." (RBI11)*
APPX_S_412	*"If we only buy it at the shop, the farmers have to transport their products to the shop. But if we provide a door-to-door service, this is convenient. Moreover, we provide a door-to-door service. Therefore, we have costs. However, we can discount them from the buying price at the shop." (RBI11)*
APPX_S_413	*"If I am uncertain when it comes to price risks, I will stop production. This is because the price may go down. However, I still keep buying latex but resell it as latex instead of producing RSS." (RBI22)*
APPX_S_414	*"I set the buying latex price from that of the latex intermediaries. They are big latex buyers with latex collecting centres. They keep small latex intermediaries informed daily. I network with them. Everyday, around seven o'clock in the morning, they are informed of the price." (RBI13)*

Quotation No.	Quotations from Interviews
APPX_S_415	*"I mostly sell my produce to the [Hat Yai] auction market. My only complaint is that the disadvantage of this market is that there is no forward contract available. There is only a cash market." (RBI08)*
APPX_S_416	*"It is not difficult to buy NR. Anyone can do it. The issue is not in buying, but selling. It means that you have to find the right time to sell your products in order to make a profit, to sell them at the best price." (RBI16)*

Appendix T: Quotations from Interview Transcripts in Chapter Five

Quotation No.	Quotations from Interviews
APPX_T_501	*"In the beginning, there was no futures market in Thailand. Some days, there was no change of prices. They even were stable for a month. Their movements were just by 0.10 - 0.20 Baht/kg. In contrast, now the situation has changed. The price may move up by 4 or down by 5 Baht/kg within a day. I am powerless in the market and have to rely on processors." (RBI24)*
APPX_T_502	*"Beforehand, I speculate rubber prices by considering the weather. If it is sunny, there will be plenty of supply. However, now I have to study widely, ranging from the economy within the country and around the world. I have to consider many things, including crude oil prices." (RBI12)*
APPX_T_503	*"Previously, I used gold and crude oil prices as the rubber price indicator but now I cannot use it anymore. Their movements are not consistent. Beforehand, if gold prices increased, oil prices would rise. Nowadays, though gold price drops, oil price may go up. Their relationship may be in opposite directions." (RBI03)*
APPX_T_504	*"Formerly, AFET was good and it worked well. If I thought prices were going to fall, I would sell in AFET because I cannot sell my stocks quickly. I was stuck in the queue at the processor. I held the stock of 30,000 kgs and I sold 6 units in AFET at 5,000 kgs a unit. Currently, AFET cannot be referenced even as a benchmark price." (RBI11)*
APPX_T_505	*"It is important to note that, beforehand, NR farmers were easy to trade with. They accepted any price I offered them. This was because they had no mobile phone to communicate with RBIs, or the means to calculate the net price. They persistently sold to us whatever price we offered. Conversely, today they have mobile phones. They will ask you for the given price before they have a final decision. Years ago, thing were much easier." (RBI12)*
APPX_T_506	*"I need the price to be volatile, but not too high. For example, in the beginning of year it is 90 Baht/kg, and then the end of the year is 180. The next year it plummets to 50 Baht/kg. Who can't manage it, can you?" (RBI20)*

Quotation No.	Quotations from Interviews
APPX_T_507	*"Actually, in recent years, price movements have been too volatile. In the early years of my trading, sometimes price changed once in a few days. It may be relevant to the information. Technology was not advanced in those days. There was no internet. Later on, prices started moving more often than before, but not as quickly as today. It may be because of the internet. Now, we have real time worldwide; so, any movement affects all." (RBI07 who had 35 years in NR trading experience)*
APPX_T_508	*"Mainly, demand and supply determine rubber price. Previously, the factors that drove price movements were fundamental factors like the weather, and seasons of rubber production. However, now the factors driving price up or down are not weather or seasons. Instead, it depends on processors' decisions." (RBI11)*
APPX_T_509	*"Currently, processors play games with us [RBIs]. Previously, they offered us the same prices from morning to afternoon. However, these days, they offer many different prices within a day to play games with us. For example, if they know that I am selling a high volume on consignment, they will not offer a higher buying price to me." (RBI11)*
APPX_T_510	*"NR prices behave like stock prices and so it is uncertain whether prices will increase or decrease. I think the first thing you have to understand is principle that the market has changed. Then you have to consider how you have to deal with it, and how you can live with it? Because the market has changed, you have to adapt yourself to the changed market." (RBI09)*
APPX_T_511	*"I think the market has started being highly volatile since the introduction of AFET. The AFET is an agriculture futures exchange market. Before that, the level of price volatility was not quite as high as it is today. At the time, prices went up or down only around 0.50 Bath a day. However, after the introduction of AFET, there were price manipulations in the market, resulting in physical markets in a psychological aspect. … Some days, it even drops 5 Baht in a physical market." (RBI11)*
APPX_T_512	*"If just only one RBI offers a higher buying price, it will affect the prices in the whole province. It causes from new RBIs. There is also an issue of there being too many RBIs. Start-up RBIs do not understand the consequence of what they are doing. However, we cannot blame them for competition as they are the newcomers; so, they have to attract customers." (RBI24)*

Quotation No.	Quotations from Interviews
APPX_T_513	*"Previously, [NR price] did not follow stock prices. Nowadays, the price fluctuates like the stock prices. For example, today the price may increase but tomorrow, on the other hand, it may decrease. So, today price risks are higher than they were before. .. Nowadays, we have to see around the world." (RBI18)*
APPX_T_514	*"Beforehand, the communication system was not as good as today. Moreover, there were not many people participating in the futures exchange market. There were just a few traders. The cause of the change is communication technology. It has made NR price more volatile." (RBI20)*
APPX_T_515	*"In the past, prices were not as volatile as today. The main cause of it is China. The participation of China drove up demand. The prices went up repeatedly from just around 30 – 40 Baht/kg to 180 then dropped dramatically. Many processors suffered losses, including me. RBIs were not greatly affected but processors were severe impacted on. Some trade two or three months in advance. Some stocked it but when the price dropped, foreign customers rejected the delivery or refuted to buy it." (RBI20)*
APPX_T_516	*"… the majority of those participating in the futures markets are speculators who are not involved with physical trading. There are just a few RBIs who trade in the futures market. The speculators mostly did not invest in long term, but they traded within a day. They bought then sold or they sold then bought. These speculators play a major role in price fluctuations. You can see how the price went up to 180 Baht/kg and then dropped to 70, as it is now. This is because speculators, isn't it." (RBI13)*
APPX_T_517	*"There are events around the world that affect rubber price movements. Events in Europe, America and China, gold and oil prices all impact on rubber prices. It is like stock trading where investors have to be active. News of the Greece crisis, QE [Quantity Easing of the USA], China's [NR] purchasing delay or China's GDP detraction all affect their movements." (RBI18)*
APPX_T_518	*"It depends on the world economy, oil prices, the Dow Jones, weather and seasons, future market prices and gold prices." (RBI21)*

Quotation No.	Quotations from Interviews
APPX_T_519	*"The big picture of rubber price movements is economy. In the long term, we have to consider the world economy, consider all such overall trends. Then, we have to narrow down to analyse the price trends in the shorter term. It cannot be correct every time. Sometimes even we make the right decision but we need sufficient capital to run our businesses. Otherwise, we may be pressured by short-term price movement in order to force us to sell our stocks. If we do not have enough cash flow, we have to decide to sell them." (RBI13)*
APPX_T_520	*"In the short term, price movements rely on seasoning and demand within the country." (RBI20)*
APPX_T_521	*"In the short term, I think price analysis of average RBIs depends on price trend analysis from processors, economic news and technical graph indicators. We cannot consider just the world economy because sometimes the technical graph can forecast the price trend for five to 10 days. That is enough for RBIs to make profits." (RBI13)*
APPX_T_522	*"There is the inconsistency of the prices with the country and in the international markets. Our demand is higher supply but demand in the consumer's country is not good. For example, processor C [which is the subsidised company of a big tyre manufacture] reduces production capacity because the world economy outlook is not good. However, there is a shortage of supply within the country. We [RBIs] have to keep buying rubber continuously so that your employees have work to do. They need labour costs for living every day." (RBI20)*
APPX_T_523	*"I will consider a fundamental factor of the rubber industry, which is demand and supply. What you do not know exactly is demand. However, you can guess it from the world economy." (RBI09)*
APPX_T_524	*"Rubber price movements are caused by its demand and supply. Unlike stock trading, rubber traders cannot manipulate prices away from its fundamental because they need warehouses to store the product. For rubber they need to deliver the physical products; so, if its prices are manipulated for some periods of time, finally, the bubble will blow up." (RBI20)*

Quotation No.	Quotations from Interviews
APPX_T_525	*"The demand and supply of rubber are the most important factors for rubber price movements. We [RBIs] cannot set the price ourselves. It totally depends on the supply and demand in the world market. If demand in the world market is high and rubber supply cannot match it, the price certainly will increase. On the other hand, if it is high supply but low demand, the price will drop as well." (RBI14)*
APPX_T_526	*"How rubber price movement depends on the world economy. We have to consider whether the world economy is good. If they [NR users] have problems within their countries, they may not buy our rubber product. It may have an effect on the rubber market." (RBI07)*
APPX_T_527	*"There are some processors who offer premium prices for us. For example, the current price is at 69 Baht/kg. The processor may offer us 72 for 500,000 kgs within a week. That is processors having orders; so, they offer higher buying prices than others. As a result, they want us to source raw material. It means the demand from processors can be known from prices they offered." (RBI12)*
APPX_T_528	*"Supply is the volume of rubber production. It depends on the weather. Fundamental factors are weather and seasons. For example, now it is the opening rubber production season after there was a shortage of supply for a while but it is unexpectedly raining. Now, there is a lower supply than usual; however, it coincides with the fact that the demand is also low. As a consequence, prices will not increase. So, I cannot stock it now." (RBI09)*
APPX_T_529	*"We [RBIs] have to follow many things such as the gold price and the Dow Jones. I wake up at 3 or 4 AM in order to see the current Dow Jones index. We have to know it. I think them all relevant to rubber prices. If the world economy is good, cars will be good to sell. Whatever is made from rubber can be sold. Airplanes also use wheels made from rubber. I think the world economy influences the rubber prices." (RBI07)*
APPX_T_530	*"There are many things you have to consider in order to analyse rubber prices. One important thing is that you have to identify a price indicator to predict rubber price. If you do not know, then you cannot forecast it. For instance, this period may not follow the Dow Jones but instead it follows the Japanese Yen. The Japanese Yen may follow Nikkei. I have to find it." (RBI09)*

Quotation No.	Quotations from Interviews
APPX_T_531	*"There are four main futures markets of rubber. They are TOCOM, the Chinese market [SHFE], AFET and SICOM. TOCOM opens the earliest in the morning and is then followed by the Chinese market and SICOM. AFET opens at 10 am. The main user is China but the Japanese market [TOCOM] is the market that RBIs are used to. It was opened before SHFE." (RBI22)*
APPX_T_532	*"In the morning at 7 am, people [RBIs] will see the prices in TOCOM. If the prices go down, they will sell NR products. TOCOM price movements have a significant impact on RBI decisions in trading. Their prices are used as a reference price for trading. Moreover, processors also use it." (RBI12)*
APPX_T_533	*"SICOM is a benchmark price for physical trading. Processors use prices in SICOM to offer buying prices. When processors set the trading prices they will calculate them from the price of the nearest contract in SICOM. You also need to know the currency exchange rate in order to calculate it." (RBI09)*
APPX_T_534	*"There are many factors that influence rubber prices. I am going to give you several details. Regarding stock markets: Dow Jones, Nikkei, Hang Seng and Shanghai Composite are the main indicators. The reason for this is that these stock markets can tell the trend of the world economy. For Europe, I consider them collectively. Every day, I have to sit and see the technical graph. For example, I have to analyse that which trends on the Dow Jones…You have to know all of these because they influence NR price movements in futures markets." (RBI09)*
APPX_T_535	*"…What you have to know, next, is commodities. Generally, they are oil and gold. Someone considered more commodities than these two. For me, just these two give me a headache enough. You have to study the technical graph analysis." (RBI09)*
APPX_T_536	*"The oil price partly affects that of rubber. Sometimes, they move in totally different directions. I think it depends on the periods of time." (RBI12)*
APPX_T_537	*"It is relevant to synthesis rubber. It is made from crude oil. So, when the oil price is expensive, the synthesis rubber will be expensive. As a consequence, it will put our rubber price up as well." (RBI05)*

Quotation No.	Quotations from Interviews
APPX_T_538	*"There are sometimes that oil prices move together with rubber prices. It is the same as those of gold prices. You can see the Dow Jones index and the gold price. Generally, when the Dow Jones goes up, the gold price will increase as well. However, nowadays, they move in opposite directions. If the Dow Jones goes up, the gold price will go lower. This is because people [investors] switch to buy stocks rather than gold as the result of QE." (RBI12)*
APPX_T_539	*"In terms of currencies, I mainly consider the exchange rate of US Dollars and Japanese Yen with Thai Baht and US Dollars with the Euro…I think the Thai Baht will be weaker as the US Dollar is stronger. When the US Dollar is strong, as a result, gold prices decrease. They are all interdependent on each other." (RBI09)*
APPX_T_540	*"Rubber prices will be automatically discounted if the Thai Baht is stronger. This is because we export in foreign currencies. As a result, we exchange them to fewer Thai Baht." (RBI06)*
APPX_T_541	*"You need to understand that we [RBIs] trade in TOCOM. As a result, as long as the Japanese Yen is unstable, going up or down at such high levels, we cannot manage our trade properly." (RBI09)*
APPX_T_542	*"Political situations have an influence on rubber price movements. If the politics are uncertain, processors may take an advantage of us." (RBI05)*
APPX_T_543	*"There are political situations in the country that impact on rubber price movements. For example, the events that I have experienced are a coup de etat, the parliament was dissolved and the rubber price intervention scheme." (RBI09)*
APPX_T_544	*"There is unsold rubber in the government stock. So, it has influenced rubber prices." (RBI23)*
APPX_T_545	*"Producing rubber has its costs. So, when the price reaches the point of production costs, it could not drop further. However, if farmers stop tapping, some of them may not have money for living." (RBI20)*

Quotation No.	Quotations from Interviews
APPX_T_546	*"If the price drops to 50 Baht/kg, you will stock it because you know that whatever happens it will increase. It is lower than production costs. At 50, I have to stock it without doubt. However, if it is at 80 or 90 Baht/kg, I have to consider it carefully because it may either go up or down." (RBI09)*
APPX_T_547	*"The price movement does not impact on my business. Whether prices climb or dive, we can manage them. Our profits depend upon our market analysis. … Because we are a merchant [RBI], the increased price does not mean gains and, in contrast, the decreased price does not mean losses. On the other hand, we may make a loss from rising prices and make a profit from falling prices." (RBI07)*
APPX_T_548	*"The movement of prices allows us to speculate on the prices, but it has to be based on fundamental factors. Otherwise we could not speculate on the price as it does not follow the price mechanism. If it is based on factors such as news, we can speculate. But if the price movements from price manipulation in the futures markets, it is difficult to know except from insider news." (RBI11)*
APPX_T_549	*"The price dropped too fast. From 180 Baht a kilo, it decreased dramatically. Some days it even declined by 10 Baht. The processor whom I had an agreement with in advanced selling wanted me to deliver the goods within the day. Otherwise it would be canceled. Moreover when I delivered USS, a grader graded it for 4% contamination rather than 3% as usual. They took an advantage of us." (RBI21)*
APPX_T_550	*"It used to be the case that I stocked USS at a processor's warehouse. Then, the prices dropped significantly. So, I decided to sell all my USS in the warehouse to the processor and a manager agreed. Five minutes later, another called me to cancel it. It happened that I could sell it a day later at three Baht below the previous price. I then made a decision to build my own warehouse and its equipment such what you can see [He shows his warehouse]." (RBI21)*
APPX_T_551	*"When the price was too volatile within a day, sometimes, I could not resell it at the appropriate price. As a result, I had to hold the stock, and wait for the price to rise. On several occasions, I had to sell later at a loss." (RBI19)*

Quotation No.	Quotations from Interviews
APPX_T_552	*"The back-to-back selling mechanism of latex trading leads to low price risks. We [latex RBI] make a constant profit margin from processors' offered prices." (RBI02)*
APPX_T_553	*"I make less profit. Sometimes, I even make a loss. I have made a loss on two deliveries as a result of decreased prices." (RBI01)*
APPX_T_554	*"The price used to reach as high as 120 Baht/kg and then, within one week, it dropped by 30 – 40. In this case it is difficult to manage it. It used to be a case that many RBIs suffered because the price was too volatile to be manageable." (RBI05)*
APPX_T_555	*"I prefer the price to increase from the current level. Farmers tended to sell to me at a high price. When price are too low, they are unlikely to sell. Sometimes, there was a shortage of NR in Malaysia, and Malaysians see that we buy it quite cheap, they will come and compete with us." (RBI06)*
APPX_T_556	*"The prices fluctuate. Sometimes they [Latex-RSS RBIs] cannot sell rubber in advance because they don't know if the price will go up or down. As a result, after they bought latex and processed it into RSS, they made a loss when they sold it. … Because I cannot buy and sell it immediately, it has to be processed before I can sell it." (RBI13)*
APPX_T_557	*"If latex price increases, it is not good for my business. I process it into rubber sheets. So, I need the difference in their prices. If they go up or down together, it will have no effect on my business. However, if they are uncorrelated, it is difficult to manage. There are around 20% of price movements which are in opposite directions." (RBI22)*
APPX_T_558	*"Now, I can say that what I can do is to keep my money invested as long as possible. This is because my capital is low. If I take more risks, I may get more losses. I have to maintain my cash so that I can wait for new opportunities." (RBI08)*
APPX_T_559	*"Price volatility does not affect my business much. If I analyse that the market price will go down next week, I will arrange forward selling. For example, if I hold 50,000 kgs of USS in stock, I will arrange 70,000 or 100,000 for price hedging of my stock holding and speculate in terms of future buying." (RBI16)*

Appendix U: Price Movement Players

This Appendix reveals the influence of the NR supply chain player on price movements. There are seven types of the players being discussed: speculation, hedge funds, NR users, processors, RBIs, politicians and NR farmers, as shown in Figure 1. Details are provided as below.

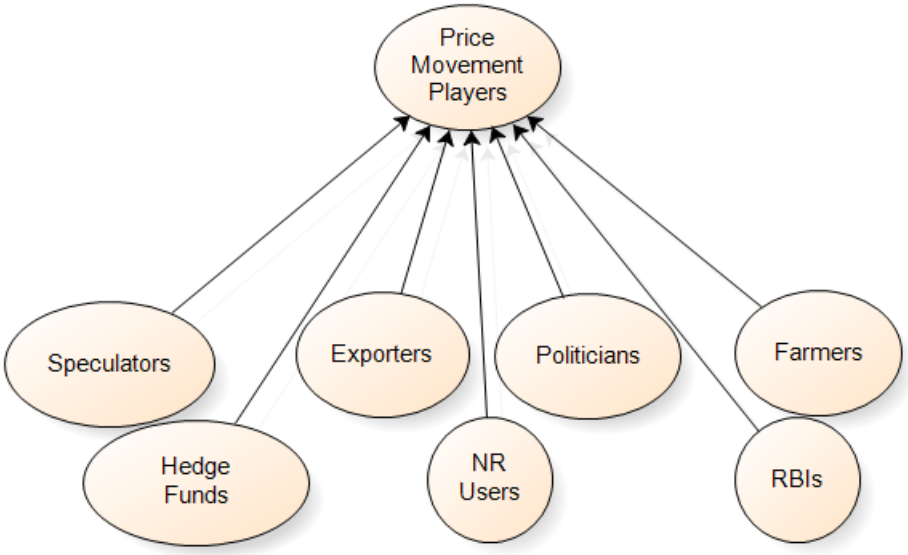


Figure 1: The final template of price movement players

1. Speculators

The majority of RBIs think that speculators play a major part in NR price movements, since futures markets are considered to be a price benchmark source. Thus, speculators participating in the futures market results in its price movements, which, in turn, impact upon prices in physical trading. As speculators are trading in the market to make profits, they have the potential to gain advantages from price movement directions, both up and down, they were suspected to be a player that makes prices too volatile. For example:

> *"I think speculators play a crucial role in the price movement in futures markets. For processors, I think they do not intend to reduce the prices. They will not take an advantage for their own country. In my opinion, they (processors and farmers), are dependent on each other. However, speculators do not care about anything. Like the gamblers, they can use any way to win. I think speculators are the most important players who influence NR price movements." (RBI13)*

Speculators provided great benefits to the futures market, as they made the market more efficient. The futures market requires a number of traders on both sides: buyers and

sellers. They make the market more uncontrollable from the dominant players, like NR processors. However, the futures market needs more stakeholders in terms of types of players like NR farmers.

> *"There is a benefit from speculators by increasing liquidity to the futures market which, in turn, makes the market easy to trade. That is, speculators are ready to change positions, both buying and selling. RBIs primarily need liquidity in getting in and out of the market for price-risk hedging. If there is no speculator in the market, they [RBIs] have to play with NR processors, so, there are too few players in the market. The speculation of investors makes me satisfied because there are more participants in the market, and it is more difficult to control. However, if NR farmers could trade in the market, it would be great." (RBI22)*

2. Hedge Funds

Regarding, hedge funds, as they had more resources to use, their impact on market price movements was significant, in both directions and magnitude. Furthermore, the effect of their withdrawal from the market was also high. One of the RBIs revealed that he had to plan his trading by incorporating the hedge fund factor into these activities.

> *"There were hedge funds that manipulated the market. It made it more difficult to manage my business. However, I was able to do it, as their point to take a profit was around 50 Yen/kg. So, I prepared to sell my stock before they took the profits. If I knew that the hedge fund was in the market, I would wait for the price to increase to about 40 Yen/kg and prepare to sell it. This is because, when the price decreases, it will drop quickly. As in my career [RBI], I cannot wait for the lowest or the highest price." (RBI11)*

The hedge fund influences the NR market in the short term if the fundamental factors are not well supported. The market price was back to a normal level after a period of time. This is evidence that with some money power, the NR price can be manipulated at some level.

> *"There are hedge funds that certainly impact the markets' price movement. I do not know the actual reason, but I notice that they will affect the market just for a period of time. It may be just one or two months that they can manipulate the market. After that, the price will back to normal. It was the manipulation. However, if politics are involved, it will take longer. If such hedge funds want to do whatsoever, they have to rely on fundamental factors." (RBI09)*

Hedge funds are the powerful players in the NR market. Some RBIs believe that they have more influence on the market price than other players. One of them expressed that:

> *"Hedge funds greatly influence the market price. They are more powerful than any other market participant. If I can give a figure, the hedge funds have power in*

influencing market prices by around 50 per cent. Processors are about 30 per cent and the rest [20 per cent] are speculators. The hedge fund is the most powerful player in the market. Whenever they participate the market, it will be fearful." (RBI18)

Another RBI added that, in terms of time of participating the market, hedge funds or their managers were not in the market for the longest time. However, if they join the market, they will become the most important players at the time. He noted that they used technical graphs as a tool to trade.

"If they participate in the futures market at the same time, hedge funds will beat NR processors. However, the processors usually take part in the market. So, they can build up price trends, considering them from technical graphs. When hedge funds come to trade in the market, they are likely to avoid conflicts with the processors. They mostly follow the price trends because they use technical graphs as a tool. When the price has a trend, hedge funds will come to the market and follow the trend. They will increase the momentum of price trends. This is the way that the processors use." (RBI22)

3. Exporters

For the RBIs' perpectives, exporters have great influence in price movement within the country. The salient example of this is the AFET, which may be dominated by exporters. They believed that exporters were able to control the price in the AFET to meet their demand.

"Currently, prices in the AFET cannot work as the reference prices anymore, because it does not work properly. They [RBIs] call it a market controller but I think that they are processors. They make the price mechanism to be in their favour. This is because the trading volume in AFET is very low. It is easily manipulated." (RBI11)

One of the reasons that cause exporters to play a vital role in market price movements is the information that they have. They can access both demand and, especially, supply of NR in the supply chain. RBIs believed that exporters utilize this information to get advantages over other stakeholders in the supply chain.

"There are just a few big processors; so, if they can co-operate, then they can offer any price they want. They take an advantage of knowing the volume of NR supply and they are highly experienced. For example, one company sell with forward contracts at over 3.0 Dollars/kg and now the price is at around 2.5 dollars. Do you think the price will increase? ... Finally, they have a lot of information, so, they can control the market. The information is very important." (RBI22)

In the domestic market, it is obvious that exporters have great power to point out market price directions. However, when there was a conflict between them, it made the price direction unclear. One RBI provided an example:

> *"There was a competition between two big processors in May. Processor A had already sold in forward contracts; so, they wanted to dump market prices. However, processor B had not sold it yet. They wanted the prices to increase in order to sell their stocks. We [RBIs] did not know who would be the winner. They were both big. Often processors compete with each other." (RBI11)*

From the RBIs' point of view, just a few exporters could buy NR from the auction market when the selling volumes were high. The auctioned prices were low when there was a large volume, rather than a small one. Therefore, small exporters, or big RBIs, could not compete to buy such a large volume. RBI22 expressed that:

> *"Auction markets may not bring better market price negotiation, because there are just a few companies that have the ability to buy it. … If there are high volumes in auction markets, it will become the market of auctioneers. However, if the volume just 40,000 or 50,000 kgs, small companies tend to buy at high prices." (RBI22)*

Apart from their price influence in the Thai market, exporters had the ability to impact on price in the international market via the futures market.

> *"Processors have great power to impact price movements, especially large processors who will participate in futures exchange markets, such as AFET. Some of the processors own some equity in brokers of AFET. … Sometimes, they push the prices up but sometimes they reduce the prices in order to lure small speculators. In my opinion, processors can control AFET most of the time." (RBI12)*

One RBI mentioned that some exporters have owned the trading specialist department in order to manage prices in the market.

> *"Recently, big processors have had groups of people who are responsible for trading in particular." (RBI09)*

4. NR Users

NR products have long known that they belong to user markets, even though Thailand produces almost one third of the world's total production. This is because there are just a small number of users relative to millions of small farmers. Thus, price movement mainly depends on the demand of these users. RBI22 expressed:

"Now, the market prices are dominated by buyers. So, this is the market of buyers, not of sellers. The buyers' market means they want cheap prices. There are rarely occasions that the price is high." (RBI22)

The prices are mainly driven by the buying behaviour of NR users. RBI11 commented:

"There are export markets that have more power than processors. They are the next sequence of buyers from processors. For example, previously we knew that China kept buying, but when China suspended buying, processors had to reduce the buying price offered. At the level of RBIs, we depend only on processors' buying prices. We cannot rely on anything else. … They [prices in the future and physical market] moved in different directions." (RBI11)

5. Politicians

As the Thailand NR industry is involved with millions of farmers, they are also voters. Therefore, politicians have influenced the market during particular periods of time. There was evidence from an RBI that the government used to intervene in the market price mechanism but it had become normal by the time he was interviewed. He mentioned that:

"Recently, the government has not influenced NR market prices. Their movements have become a normal price mechanism." (RBI10)

Another of RBIs explained how government policy may impact market prices and not always in the way that the government desires.

"The NR price sometimes depends on the government policy. For example, one of the price intervention schemes of this government is to limit the quota of processors at a 10% reduction. It directly affected processors. Some processors have already sold it in advance; so, do you think they will give up and get losses? As a result, they dumped the price in order to make profits." (RBI18)

In respect of the price intervention scheme, politicians can play a role in the market price movement via the news that they give to the media. Such news may influence the NR market players' actions in risk taking. Another RBI expressed that:

"Politicians take part in price movement as they talk to the news media. The news affects the RBIs' decisions in risk taking. When I hear the news, I might take a risk, even if I did not agree with them. My competitors took action, so, I had to offer a high price as well to prevent all the NR being sold to them." (RBI06)

6. Rubber Business Intermediaries

RBIs are likely to have less power to influence price movement relative to their business counter party, the processor. They count on what processors provide to them. One RBI compares their power, and that of the processors', in the price influence in the NR market.

> *"We [RBIs] cannot access the complete price mechanism. They [processors] can use every market. So, we have to admit it at some levels. I would like to gather an RBI to build up market power to negotiate with them. We cannot discount their power. Instead, we have to increase our market power. As a consequence, their power to control the market will be reduced. The only way to do it is to increase our potential to become closer to them." (RBI22)*

Even though the majority of RBIs do not directly participate in futures markets, they may influence price movements via processors. Since they rely mainly on their business partners (mostly processors) to hedge price risk, or sometimes for speculative purposes, their business partners may take actions that impact on price movements based on RBIs decisions. One RBI explained:

> *"It is a fundamental attitude towards the prices of RBIs; I am aware of community. Regarding our community, sometimes I questioned why some RBIs sold to processors at too low prices relative to production costs. They should not sell it at that price as, if they do not sell; processors will not decrease buying prices. I could not stop them from selling." (RBI13)*

RBIs may influence price movements by handling NR supplies. There is evidence that, not only do they maintain the balance of supply, but also they sometimes make the supply even more imbalanced as their speculation behaviour. For example: *(Q5066).*

> *"During the period when the price was expected to increase to 200 Baht/kg, every RBI kept stocking NR. At the time, it was the season of high production. It even allowed them to stock more so there was a high volume of stocks. When prices started to drop, they sold their stocks. As a result, processors could not handle it." (RBI12)*

Some of the RBIs believed that some Tier 2 RBIs might have the power to influence market prices. One of the Tier 2 RBIs described:

> *"There are some big RBIs that have power to impact physical market prices. I am a small RBI. I do not know whether bad news given by the big RBIs and processors is real. However, as a consequence, they discount the buying price from us and farmers." (RBI19)*

7. NR Farmers

NR farmers have less power (in reality, any power at all) to influence price movements. They outnumber other players in NR supply chains, but the majority of them are smallholders. They own just a few hectares of NR plantations. Even though they know the costs of production, sometimes they have to produce at a loss because they have to earn a living. To sustain a price mechanism system, one of the RBIs suggested that farmers should take a more active role in the futures market.

> *"If NR farmers could take part in futures markets, I think the NR market would be more sustainable. Now, the price mechanism has not yet been completed. If the farmers are trained to trade in the futures market, they can lock the selling prices to sell their product. There are two stakeholders who will have the most advantage from price hedging. The first is the processors because, when they bought the NR to be processed, they already knew the costs and volume to hedge price risks. The other one is the farmer. They knew their costs of production, so they knew how much they should sell their products for." (RBI22)*

RBI13 also mentioned that farmers play a weak role in price movement, despite how significant price movements' impact them.

> *"The government should find the solution that will help the NR farmers to trade in the futures markets as well." (RBI13)*

Appendix V: The Reflective Researcher

The researcher was born and grew up in a family that farmed NR. Therefore, the familiarity to the NR industry and high motivation are considered to be strong points to conduct the research. Moreover, his hometown represents the biggest NR producing province in Thailand and he will go back to be a lecturer at the University in the province. This will increase his motivation to study the issue as he will serve the local community and most important industry in the area.

My research journey started around four years ago when I was granted a scholarship from Suratthani Rajabhat University to pursue a PhD degree abroad. At an early stage, regarding my background of a Bachelor's in Mathematics and Master's degree in Computer Science, I decided to select the topic of *"Prototyping a Decision Support System for Natural Rubber Production in Thailand: Modelling Price Forecasting Mechanisms for Natural Rubber Products"* in order to apply my existing knowledge to the main local industry where the University was located. However, price forecasting methods seemed to be inappropriate to use in the context of RBI businesses. Despite the concerns relating to forecasting method performance, their levels of accuracy tend to be low relative to the small profit margin in the RBI business. Moreover, during a year of researching NR price modelling, I learned more about research methodologies, especially a qualitative research approach that was often used in the Information Management Innovation (IMI) research group in which I am a member. I realised the potential of it, using it to complete my PhD research. The crucial moment when I decided to change my research design from the postivism paradigm to interpretivism was when I attended the UKAIS 2012 PhD and Professional Doctorate Consortium as my supervisor suggested. I gained benefits from the comments on my research design.

Changing from the postivist to interpretivist paradigm made me face the difficulties at the beginning. Even though I desire to participate in a new world of research that is different from my background as I see its advantages, the critical thinking and arguing that it requires were difficult for me to grasp due to my cultural background and because I am from a quantitative research background. As Thai students, we are expected to respect teachers, supervisors and superiors, and to argue with them is not the behavioural norm. Moreover, critical thinking in English as a second language is also difficult for me. I spend a long time learning to explain my research in English. However, I have learned to understand that only descriptive language is not enough for a PhD student. I need to do more by writing and discussing in a more critical and evaluative form. These developments are ongoing.

However, becoming a qualitative researcher who has an established quantitative background can be considered an advantage. I gain an understanding of both approaches in terms of their benefits and limitations. As a PhD candidate I have to learn how to conduct research. In order to fulfil my future career plans to be a lecturer and researcher I need to succeed in these skills. A qualitative approach that I adopted when conducting my PhD research allows me to gain a deep understanding of the Thai NR industry context. As a result, I have an opportunity to do further research into the industry, utilising both qualitative and quantitative methods, to increase understanding and provide solutions to the industry. This has tremendous benefit for local impact and value of the research undertaken.

Glossary

AFET	Agricultural Futures Exchange of Thailand
APPX_S_4XX	Quotation No. XX of Chapter Four in Appendix S
APPX_T_5YY	Quotation No. YY of Chapter Five in Appendix T
CAQDAS	Computer Aided Qualitative Data Analysis Software
CBOT	Chicago Board of Trade
Cup lump RBI	A Rubber Business Intermediary who trades cup lump
DRC	Dry Rubber Content
FOB	Free on Board
IPA	Interpretative Phenomenological Analysis
IRCo	International Rubber Consortium
Latex RBI	A Rubber Business Intermediary who trades latex
Latex-RSS RBI	A Rubber Business Intermediary who processes latex into RSS
Latex-USS RBI	A Rubber Business Intermediary who processes latex into USS
MACD	Moving Average Convergence Divergence
NR	Natural Rubber
ORRAF	Office of the Rubber Replanting Aid Fund
PRM	Price Risk Management
RBI	Rubber Business Intermediary
REO	Rubber Estate Organization
RRIT	Rubber Research Institute of Thailand
RSI	Relative Strength Index
RSS	Ribbed Smoked Sheet rubber
SHFE	Shanghai Futures Exchange
SICOM	Singapore Commodity Exchange
SR	Synthesis Rubber
STA	Sri Trang Agro-Industry Public Company Limited
STO	Stochastic Oscillator

STR	Standard Thai Rubber
TLA	Thai Latex Association
TOCOM	Tokyo Commodity Exchange
TRA	Thai Rubber Association
USS RBI	A Rubber Business Intermediary who trades USS
USS	Unsmoked Sheet rubber

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